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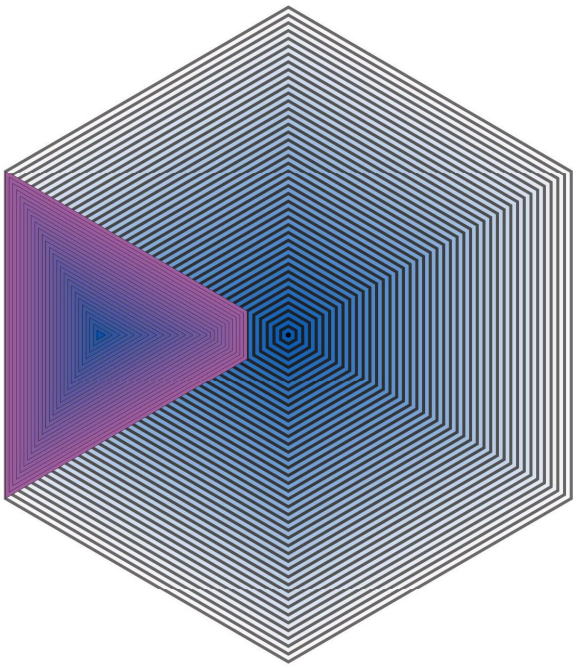

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ARTIFICIAL INTELLIGENCE (AI): SOLUTION OR NEW PROBLEMS?

Muhammet Usak
Discimus Doo, Republic of Serbia

Human history is characterized by a constant encounter with new inventions and evolving circumstances. Fundamental transformations of the early ages included the shift from cave drawings to the first written tablets, the domestication of animals, and the transition to agricultural and settled societies. Similarly, innovations impacting education and instruction have ranged from the move from oral to written culture, the adoption of blackboards, and the faster production of written materials following the invention of the printing press, to the transformative effects of television and computers. While all these inventions have introduced innovations, they have concurrently presented new problems. Nevertheless, certain technological advancements have streamlined operations within the educational and scientific communities.

For instance, the migration of articles and theses from physical documents to electronic formats, coupled with the development of plagiarism detection software, has made it straightforward to identify instances of academic dishonesty. This development has substantially eased the workload for editors, universities, and researchers. In contrast, detecting any instance of plagiarism was a protracted process during periods when sources were not digitally available. Just as the issue of plagiarism appeared to be managed in this context, the rapid development of Artificial Intelligence (AI) emerged, introducing new complexities.

AI in Academic Research: Efficiency vs. Integrity

AI has undeniably simplified the work of researchers, particularly those publishing articles in non-native languages, by offering significant support in minimizing linguistic and grammatical errors. However, this assistance can inadvertently result in a mechanical language within manuscripts, especially for researchers who lack sufficient command of the required academic jargon in their respective fields.

Alarmingly, some researchers have progressed beyond using AI solely for language refinement, opting for the path of least resistance by employing these tools to directly generate and publish their work. This practice has generated two distinct challenges for academic journal editors and universities: the urgent need for new AI detection tools to identify AI-generated content and complex ethical issues. The debate over whether or not AI should be recognized as a co-author remains unresolved. A critical side effect of AI-produced articles is the presence of irrelevant references and highly formulaic sentence structures—issues that are often overlooked by researchers who do not possess deep mastery of the subject area and its associated language.

AI in Education: Skills and Reliability Concerns

While academic journals grapple with these issues, 21st-Century education and instruction faces its own set of problems alongside technological convenience. Examples include screen addiction and the reliance of students on AI to complete assignments and projects. Although students using AI may appear to gain an advantage, particularly when instructors lack technological competence and literacy, AI is progressively impacting several of their fundamental skills. It negatively influences essential abilities such as critical

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thinking, coherent writing, logical reasoning, and problem-solving. Furthermore, the veracity of information currently generated by AI constitutes a separate and significant concern. For example, when asked about a country that has never had a woman president, AI may still produce an incorrect or nonsensical response, such as "the country's prime minister answers as the President."

Reliability constitutes another major challenge. If a student denies the use of AI when questioned about the authorship of an assignment, serious academic integrity issues arise. While a technologically proficient instructor can utilize detection tools to uncover the situation, the outcome is quite different for educators who are less familiar with technology.

It is evident that AI has already begun to significantly influence the lives of educators, journal editors, and publishers, and its future impact is guaranteed to be greater. To prevent the introduction of new problems into the field, there is a clear need for competent editors and educators who can effectively control the accuracy and validity of information. For example, when a study on the pedagogical content knowledge of a science teacher is submitted, the subject editor's deep familiarity with the relevant literature during the initial review process will enable them to readily identify a potentially AI-generated submission.

Finally, numerous studies on the use of AI in education have been published (Samara, & Kotsis, 2024; Usak, 2024; Yıldızhan Bora, & Şahin Kölemen, 2025; Xiaofan, & Annamalai, 2025; Karampelas, 2025; Nikolopoulou, 2025; Anđić, 2025; Uyar, 2025), some are forthcoming, and many more are currently under review. Rather than replicating existing work, it would be more beneficial for researchers to focus on studies that introduce novelty to the field and offer solutions to existing problems. The answer to the question posed in the title will ultimately be provided by researchers, readers, and stakeholders.

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EFFECTIVENESS OF FLIPPED CLASSROOMS IN ENHANCING SELF-STUDY COMPETENCY AND ACADEMIC ACHIEVEMENTS IN VIETNAM'S SECONDARY SCHOOLS

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Abstract

Self-study has been recognized as a core competency in Vietnam's General Education Curriculum, underscoring its essential role in students' holistic development. This study employed a quasi-experimental design to examine the effectiveness of the flipped classroom model in enhancing self-study competency and academic achievement among secondary students. The intervention, focusing on the topic "Mixtures and Separation of Substances" in Grade 6 Science, involved 137 students from four classes at two secondary schools in Hanoi during the second semester of the 2022–2023 academic year. Two classes (n = 68) were taught using the flipped classroom model (experimental class), while the other two (n = 69) followed conventional teacher-centered teaching (control class). Academic performance tests and a validated seven-item self-study competency scale were used to assess outcomes. Data were analyzed using descriptive statistics, Wilcoxon signed-rank tests, and Mann–Whitney U tests. Results showed that flipped teaching significantly improved both academic achievement and self-study competency, with the experimental class outperforming the control class. No significant difference was found between the two experimental classes, suggesting consistency in the intervention's effects. These findings highlight the potential of the flipped classroom model to foster autonomous learning, improve educational outcomes, and inform future teaching practices in Vietnamese secondary education.

Keywords: *academic achievement, flipped classroom, secondary science education, self-study competency, Vietnam*

Introduction

In today's rapidly evolving technological and professional landscape, schools are no longer the sole providers of knowledge. As a result, fostering self-study competency has become an essential prerequisite for lifelong learning. In response to this need, Vietnam's 2018 General Education Curriculum reform identified self-study as one of the core competencies to be cultivated in students, aiming to prepare them for continuous learning and meaningful engagement in both national and global development efforts (Ministry of Education and Training, 2018).

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Despite this curricular emphasis, recent studies reveal persistent challenges regarding Vietnamese students' self-study abilities. Many students remain passive learners, struggle to meet academic expectations, and demonstrate limited self-directed learning skills. Moreover, active teaching strategies designed to enhance this competency are not yet widely implemented. Nonetheless, the widespread availability of digital devices and students' frequent engagement with online environments (Hong et al., 2023) offer promising conditions for deploying innovative models that could foster self-study competency more effectively.

Among these models, the flipped classroom has gained considerable attention. This approach leverages technology to invert the traditional sequence of instruction: instructional content (e.g., videos, readings) is delivered outside of class time, while in-class sessions are devoted to active learning activities such as discussion, inquiry, and problem-solving (Bergmann & Sams, 2012; Garrison & Anderson, 2003). The flipped classroom model has been widely adopted across education levels, with numerous meta-analyses and systematic reviews confirming its positive effects on student performance, engagement, and self-regulated learning (Al-Samarraie et al., 2020; Jradi, 2019; Strelan et al., 2020). The model's effectiveness is attributed to its capacity to provide structured, active learning environments that promote problem-solving and autonomy (Strelan et al., 2020), although challenges such as video length and preparation time remain (Al-Samarraie et al., 2020).

In the Vietnamese context, a growing body of literature has explored the theoretical perspectives and pedagogical approaches for developing self-study competency (Dai et al., 2021; Lê & Bùi, 2017; Thai, 2022). However, most empirical studies have focused primarily on upper secondary school and university students—learners who typically possess more mature self-regulation skills. By contrast, empirical research targeting secondary school students remains scarce. Given that early adolescence represents a critical stage for cultivating foundational learning competencies, there is a pressing need for research exploring effective strategies to support self-study competency development at this educational level.

In the field of science education, the flipped classroom model holds particular promise due to its alignment with inquiry-based learning and opportunities for practical experimentation (Bergmann & Sams, 2012). However, little empirical attention has been devoted to applying the flipped model in Grade 6 Science, particularly for the topic "Mixtures and Separation of Substances." This topic builds directly upon students' prior knowledge from Grade 5, involves familiar real-world contexts, and lends itself to independent, safe learning at home through multimedia materials.

Given these gaps, the present study examined the effectiveness of a flipped classroom model in enhancing Grade 6 students' self-study competency and academic achievement using the topic "Mixtures and Separation of Substances" as a case study. The findings are expected to inform the integration of digital learning models into early secondary science education in Vietnam.

Theoretical Framework

Flipped Classroom as a Pedagogical Innovation

The flipped classroom is an emerging educational approach that leverages digital technologies to invert the conventional teaching sequence. Initially conceptualized by Bergmann (2007), this model shifts content delivery to the pre-class phase, typically through recorded videos or online materials, while repurposing class time for collaborative problem-solving, discussion, and hands-on learning (Bergmann & Sams, 2012; Bishop & Verlege, 2013).

Unlike conventional teacher-centered teaching, where theoretical content is introduced during class and practiced at home, the flipped model encourages students to engage with

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foundational knowledge prior to class (Duc, 2020). Teachers then serve as facilitators during class, guiding students through inquiry-based activities that deepen conceptual understanding (Thai, 2022). As a form of blended learning (Bishop & Verlege, 2013; Marks, 2015), the flipped classroom integrates active learning, scaffolding, cooperative learning, and problem-based approaches, making it highly compatible with the competency-based orientation of Vietnam's General Education Curriculum (Akcayir & Akcayir, 2018).

Empirical studies and meta-analyses have demonstrated that flipped classrooms enhance learner autonomy, self-regulation, engagement, and academic achievement across disciplines (Hamdan et al., 2013; Shao & Liu, 2021). In science education, the model has proven particularly effective, as it supports inquiry-based practices and provides extended time for hands-on experimentation (Chen, 2021; Łopińska et al., 2022; Zhao et al., 2021). Despite its benefits, challenges such as students' readiness for self-study, unequal access to technology, and resistance to shifting classroom roles remain significant (Alqarni, 2018; Talbert, 2015).

While flipped learning is widely adopted at the secondary and tertiary levels, its implementation in secondary education—particularly in Vietnam—is still limited. Few empirical studies have examined its potential in Grade 6 science, highlighting a critical research gap that this study seeks to address.

Self-Study Competency in Contemporary Education

Self-study competency is defined as the ability of learners to plan, manage, and evaluate their own learning processes independently. Rooted in theories of self-directed and self-regulated learning (Candy, 1991; Zimmerman, 2002), this competency includes metacognitive regulation, motivational control, and strategic use of learning tools.

A widely accepted framework for self-regulated learning comprises three phases: planning, implementation, and self-assessment. These phases correspond to key skills such as goal setting, resource selection, monitoring progress, and reflective evaluation (Zimmerman, 2002). Influential educational theorists such as Dewey and Montessori emphasized active learner participation, while contemporary research highlights the importance of differentiated instruction and formative feedback (Shayer & Adey, 2002; Smith, 2008).

In Vietnam, the 2018 General Education Curriculum explicitly designates self-study as a core competency to be developed from primary through upper secondary levels (Ministry of Education and Training, 2018). Recent studies have proposed pedagogical strategies, learning tasks, and assessment frameworks aimed at fostering self-study abilities in students (Thai, 2022; Thuy & Trung, 2021). However, most empirical evidence to date has focused on upper secondary or university students. For younger learners—such as those in Grade 6—systematic interventions are still rare.

Drawing on both theoretical models and Vietnamese curricular requirements, this study employs a structured framework comprising three main components and seven specific criteria (Table 1). This framework was used to assess students' self-study competency development before and after the intervention.

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Table 1
Components and Criteria of Self-Study Competency

Component	Criterion
Planning the self-study process	1. Set learning goals and select appropriate content.
	2. Develop a study plan including methods, resources, and time allocation.
Implementing the study plan	3. Search, analyze, and evaluate information for relevance and accuracy.
	4. Apply knowledge and skills to solve learning tasks.
	5. Take notes, organize knowledge, and make adjustments as needed.
Evaluating and adjusting	6. Assess learning outcomes using criteria and self-assessment tools.
	7. Reflect and modify the approach for future self-study activities.

Integration of the Flipped Classroom and Self-Study Competency

There is a strong theoretical and pedagogical alignment between the flipped classroom model and the development of self-study competency. The pre-class learning phase, a hallmark of flipped teaching, requires students to engage in goal setting, time management, and independent information processing—closely aligned with the planning and implementation components of self-study competency (Criteria 1–3).

In-class activities, which include inquiry-based discussions, peer collaboration, and problem-solving, provide opportunities for knowledge application and critical thinking (Criterion 4). Simultaneously, students are encouraged to take notes, refine their understanding, and adapt learning strategies (Criterion 5). The post-class phase often involves self-evaluation and reflection activities that promote deeper metacognitive engagement (Criteria 6–7).

While previous studies have highlighted the benefits of flipped classrooms in improving academic performance and fostering engagement (Shao, 2021), fewer have explicitly examined their impact on core competencies—particularly self-study—among secondary students. This gap is especially relevant in the Vietnamese educational context, where competency-based education is being promoted nationally but requires more empirical validation at younger grade levels.

Accordingly, this study was designed to examine the effectiveness of a flipped classroom intervention on the development of self-study competency and academic achievement among Grade 6 students, focusing on the science topic "Mixtures and Separation of Substances." By integrating principles of flipped learning with a structured competency framework, the study seeks to generate actionable insights for teaching innovation and curriculum implementation in Vietnamese secondary education.

The flipped classroom model supports all three components of self-study competency—planning, implementation, and evaluation—through distinct phases of instruction. Figure 1 illustrates how the before-class, during-class, and after-class stages of flipped teaching align with specific criteria of self-study competency development in the context of the Grade 6 science topic "Mixtures and Separation of Substances."

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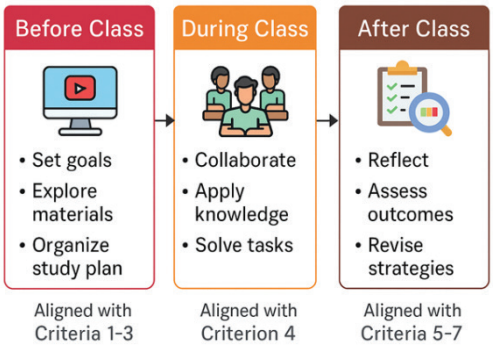
Figure 1
Developing Self-study Competency through Flipped Classroom Instruction



Note: Each phase corresponds to specific criteria within the self-study competency framework.

Research Questions

Building on the above theoretical perspectives and addressing the identified research gaps, the present study was guided by the following research questions:

(1) Does the flipped classroom model improve students' self-study competency?
(2) Does the flipped classroom model enhance students' academic achievement?
(3) Are there differences in students' self-study competency and academic achievement between students from two schools after participating in the flipped classroom course?

Research Methodology

Design

This study adopted a quasi-experimental design with a non-equivalent control class to examine the effectiveness of flipped classroom teaching in fostering self-study competency and improving academic achievement among sixth-grade students. The research design included both within-class (pre–post comparisons) and between-class (comparisons between the experimental and control classes) analyses. To ensure fairness in educational time, all classes were provided with equivalent total learning hours: while the experimental classes engaged with pre-class videos and in-class activities, the control classes received the same content entirely through traditional, in-class teaching. The study was conducted during the second semester (January to May 2023) in two secondary schools located in Hanoi, Vietnam. The topic "Mixtures and Separation of Substances" was selected based on its alignment with Grade 6 science curriculum and suitability for flipped teaching.

Participants

The study was conducted during the second semester of the 2022–2023 academic year in two secondary schools in Hanoi, Vietnam. A total of 137 sixth-grade students from four classes participated. The chosen topic, "Mixtures and Separation of Substances," builds upon students' prior knowledge from Grade 5, involves familiar real-world contexts, and lends itself directly to independent, safe learning at home through multimedia materials. The entire enrollment of the four classes was included, resulting in a total sample size of 137 students. This intact-class design is a common approach in quasi-experimental research to preserve ecological

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validity in natural classroom settings. Two classes (n = 68) were assigned to the experimental group (flipped classroom), and the other two classes (n = 69) to the control class (conventional teaching). Each group exceeded 30 participants, which is generally considered sufficient for applying inferential statistical analyses such as t-tests and ANOVA (Cohen, 1988). While the sample size is moderate, it is comparable to or larger than those employed in similar classroom-based studies, thereby supporting the validity of the experiment. Future research with larger and more diverse samples is recommended to enhance generalizability. Table 2 summarizes the participant distribution. Ethical approval was obtained from the school administrators prior to data collection. Participation was voluntary, and parental consent was secured for all students. All data were anonymized, and no personal identifiers were collected.

Table 2
Participant Distribution by School and Class

School	Experimental Class (*n*)	Control Class (*n*)	Topic
Hanoi – Amsterdam High School for the Gifted	6E (40)	6D (37)	Mixtures
Marie Curie Hanoi School – Ha Dong	6I6 (28)	6I5 (32)	Mixtures

Instruments

To evaluate the effectiveness of the flipped classroom intervention in enhancing students' self-study competency and academic achievement, a combination of teacher- and student-centered tools was employed. These instruments were designed in accordance with the competency-based orientation of the Vietnamese General Education Curriculum and were supported by contemporary educational research.

A three-level rubric was developed based on seven core indicators of self-study competency. These indicators are aligned with the structure and goals of the national curriculum for developing students' independent learning capacity (Ministry of Education and Training, 2018). The rubric was used in two ways: by teachers to observe and assess students' demonstration of self-study behaviors during classroom activities, and by students for self-monitoring and regulation of their learning throughout the flipped classroom process. This dual use aligns with findings in the literature emphasizing the value of rubrics in fostering self-regulated learning, clarifying assessment expectations, and supporting reflective practices (Huyền et al., 2023; Jonsson & Panadero, 2017; Shilpa, 2022).

However, for research purposes, only the teacher-observation data were processed and analyzed to ensure consistency and reliability in evaluating student self-study competency across classes.

Students' performance in self-study was classified into four levels for reporting: Low (< 1.50), Medium (1.50–1.99), Fair (2.00–2.49), Good (≥ 2.50).

To assess academic achievement, two written tests were employed: Test 1, administered at the beginning of the intervention, consisted of 10 multiple-choice questions (graded on a 10-point scale). Test 2, given after the in-class phase, included 5 short-answer questions (also graded on a 10-point scale). The complete test content is accessible online at the following link: https://drive.google.com/file/d/1auJvy-Hq1xHq8yDclB84t9CXF9ZttNG3/view?usp=drive_link

The use of written tests to measure learning outcomes is widely supported in educational research, as they provide structured and scalable means of evaluating both factual knowledge and application skills (Fitria, 2024).

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Procedure

The study followed a three-phase flipped classroom model implemented in the topic "Mixtures and Separation of Substances" for sixth-grade students. Instructional materials included e-learning content, digital worksheets, and guiding questions accessible via an online platform. The development of self-study competency was tracked across five indicators (Criteria 1–5), aligned with each learning phase as follows:

Before Class (Self-study Phase): Students in the experimental class independently accessed learning resources and planned their learning. This phase targeted Criteria 1–3 (goal setting, planning, and material usage). At the end of this phase, students completed Test 1 (10 multiple-choice questions) in a controlled setting.

During Class (Collaborative Learning Phase): Classroom sessions emphasized problem-solving, peer collaboration, and teacher feedback. Activities supported Criterion 4 (task execution) and Criterion 5 (strategy adjustment). Teachers observed and assessed students' performance using a three-level rubric.

After Class (Reflection Phase): Students completed a structured self-assessment, reviewed their progress, and identified strategies for improvement. Test 2 (5 short-answer questions) was administered to assess academic achievement.

Data Collection and Analysis

Quantitative data were analyzed using IBM SPSS Statistics Version 20. Tests for normality were performed using the Shapiro–Wilk test to assess the distribution of the data. Since the results indicated non-normal distributions ($p < .05$), appropriate non-parametric statistical methods (e.g., Wilcoxon signed-rank test, Mann–Whitney *U* test) were employed for further analysis. Table 3 summarizes the statistical procedures applied to address each research question.

Table 3
Statistical Tests Employed for Each Research Question

Research Question	Focus	Classes	Tool(s)	Timing	Statistical Test
1	Competency improvement	Experimental only	Teacher rubric	Pre and post	Wilcoxon signed-rank test
2	Learning outcomes	Experimental and control	Test 1, Test 2	Post	Mann–Whitney *U* test
3	Cross-class performance analysis	Two experimental classes	Rubric, Test 1, Test 2	Post	Wilcoxon and Mann–Whitney *U* tests

Research Results

Self-study Competency

Improvement Across Self-study Criteria

The effectiveness of the flipped classroom model in enhancing students' self-study competency was evaluated by examining changes across seven dimensions using the Wilcoxon signed-rank test. As depicted in Figure 2, a clear improvement was observed across all seven criteria following the intervention, with the orange polygon (Post- Flipped Classroom Teaching)

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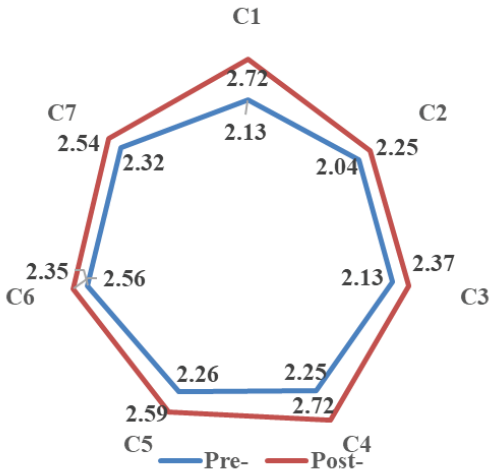
enveloping the blue polygon (Pre- Flipped Classroom Teaching). Statistically significant improvements ($p < .05$) were found in five of the seven criteria. The most pronounced gain was in C1 (defining learning objectives), with the average score increasing from 2.13 to 2.72. Significant improvements were also noted in C2 (organizing learning tasks), which rose from 2.04 to 2.25, and in C3 (using digital resources), increasing from 2.13 to 2.37. Furthermore, gains were registered in C6 (self-monitoring), which rose from 2.35 to 2.56, and in C7 (intrinsic motivation), with scores increasing from 2.32 to 2.54.

Figure 2

Changes in Students' Self-Study Competency Scores Pre- and Post-Flipped Classroom Teaching



Limited Gains in Higher-Order Competencies

While overall trends were positive, improvements in C4 (applying knowledge to solve problems) and C5 (note-taking and the organization of knowledge) were not statistically significant ($p > .05$). These dimensions involve higher-order cognitive skills that typically require prolonged engagement and explicit strategy instruction. The limited duration of the intervention, along with students' early stage of cognitive development, may have constrained growth in these areas.

Consistency Across School Contexts

To assess the generalizability of the intervention, post-intervention self-study scores were compared between the experimental classes at Hanoi–Amsterdam and Marie Curie schools. Analysis using the Mann–Whitney *U* test showed no statistically significant differences across all seven criteria ($p > .05$), suggesting that the flipped classroom model had consistent effects regardless of school-specific factors such as student demographics or institutional context.

Academic Achievement

Students' academic achievement was assessed through two tests conducted before and after the flipped classroom intervention. Prior to the implementation, both the experimental and

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control classes achieved the same average score on Test 1 (M = 8.01), and the Mann–Whitney U test confirmed no significant difference between the two groups (U = 2304.50, p = .853). This suggests equivalence in students' baseline knowledge, thereby validating the comparability of the two groups at the outset.

After the intervention, the experimental class outperformed the control class on Test 2, with a higher mean score (M = 8.63 and 8.00) and a narrower standard deviation (1.208 and 1.404), indicating not only improved performance but also more consistent outcomes. The difference was statistically significant (U = 1736.00, p = .007), supporting the effectiveness of the flipped classroom in enhancing academic achievement.

Within-group analysis using the Wilcoxon signed-rank test showed that students in the experimental class significantly improved from Test 1 to Test 2 (Z = -4.189, p < .001), providing further evidence of the intervention's positive impact.

When comparing the two experimental classes from Hanoi–Amsterdam and Marie Curie schools, results indicated no statistically significant difference in Test 2 scores (M = 8.93 vs. 8.46; U = 437.50, p = .110). This suggests that the flipped classroom model yields consistent benefits across different educational settings, irrespective of school-specific characteristics.

In sum, the flipped classroom model contributed not only to enhanced self-study competencies but also to statistically significant and educationally meaningful gains in academic performance. These results reinforce the model's potential as a scalable and effective educational strategy in secondary science education.

Discussion

This study's findings provide empirical evidence for the effectiveness of the flipped classroom model in enhancing both self-study competency and academic achievement among secondary school students.

Interpreting Key Findings

The intervention effectively enhanced students' planning, resource management, and intrinsic motivation—all core components of self-regulated learning (Zimmerman, 2002). The most significant gains were in students' ability to define learning objectives (C1) and manage digital resources (C3). This suggests that the structured pre-class content and tasks provided a scaffolded environment for fostering autonomous learning habits. This aligns with prior research emphasizing the value of combining multimedia with learner-centered strategies to promote self-regulation (Strelan et al., 2020). The observed increase in intrinsic motivation (C7) further reinforces the role of autonomy-supportive environments in sustaining engagement, a particularly relevant factor for learners in transitional developmental stages. The improved digital literacy among students highlights the potential of technology to cultivate academic independence, a goal consistent with Vietnam's 2018 General Education Curriculum (Ministry of Education and Training, 2018). These results collectively support flipped teaching as a mechanism for promoting self-study in secondary contexts.

In addition, the significant improvements in academic achievement within the experimental group resonate with previous research affirming the benefits of flipped teaching. The combination of pre-class preparation and interactive, problem-based in-class activities appears to have deepened students' conceptual understanding and knowledge retention, an effectiveness observed in various secondary education contexts (Wei et al., 2020). This outcome supports the notion that integrating technology with student-centered learning environments fosters engagement, comprehension, and knowledge retention (Al-Zahrani, 2015; McLaughlin et al., 2014; O'Flaherty & Phillips, 2015).

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Explaining Limited Gains

Despite overall positive trends, the intervention did not yield statistically significant improvements in higher-order competencies related to problem-solving (C4) and information organization (C5). This outcome can be interpreted in light of two key factors: cognitive development and intervention design. These skills require advanced metacognitive regulation and explicit instruction–elements that may have been constrained by both the limited duration of the intervention and the developmental stage of sixth-grade students.

The challenges faced by younger students in engaging with complex inquiry tasks and applying systematic note-taking strategies align with recent findings from studies on cognitive development in science learning (Fernández et al., 2022; Teo & Goh, 2019). Similarly, recent research has highlighted that middle school students frequently underperform in recognizing interconnections and understanding systems thinking (Li & Li, 2023). Therefore, while the flipped model successfully fostered foundational self-study skills, it may require a longer intervention period and more targeted, explicit scaffolding to cultivate higher-order cognitive competencies.

Implications for Practice and Policy

The findings of this study have important implications for both educational practice and policy. First, the comparable outcomes across both study sites indicate that the flipped classroom model is adaptable and can be implemented effectively in varied institutional settings. The consistency of results suggests that when core principles–such as curricular alignment, effective teacher facilitation, and equitable access to digital resources–are met, flipped learning can yield positive outcomes across diverse educational settings (Lo & Hew, 2018; Sarker et al., 2023). This adaptability enhances the model's scalability and positions it as a viable strategy for achieving broader equity goals in national education systems (UNESCO, 2015).

For practical application, the study highlights the importance of age-appropriate pre-class scaffolds and structured in-class activities. To foster deeper cognitive skills, educators could integrate strategic tools such as digital notebooks and inquiry templates, along with continuous formative feedback (Jonsson & Panadero, 2017). The benefits of such scaffolding and instructional sequencing in enhancing self-regulation and resource management have been further emphasized by recent research (Subagyo & Widodo, 2024; YunLin Sun et al., 2023). At the policy level, these findings affirm the feasibility of embedding flipped teaching into competency-based curricula. The model provides a practical framework for balancing digital innovation with pedagogical reform, particularly in the Vietnamese context, where such approaches remain underutilized at the secondary level.

Conclusions and Implications

This study has confirmed that the flipped classroom model is an effective pedagogical approach to enhance both self-study competencies and academic achievement among Grade 6 students in Vietnam. By applying this model in two contrasting school contexts, the study has established its broad applicability and scalability, regardless of students' academic backgrounds or school profiles.

Furthermore, the research has addressed a significant gap in the literature by providing empirical evidence on the use of flipped learning at the secondary level – a domain largely underexplored in prior studies that often focused on higher education.

These findings underscore the value of integrating student-centered, technology-enhanced methods in secondary education, especially in alignment with Vietnam's General

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Education Curriculum. The study has demonstrated that flipped classrooms can not only improve academic outcomes but also cultivate essential learning competencies in younger learners.

The study has also highlighted the importance of teacher facilitation and digital resource design in optimizing the benefits of flipped learning. As such, it serves as a practical reference for policymakers and educators seeking to innovate classroom practice within the context of curricular reform.

Looking ahead, this research lays a foundation for further investigation into the long-term impacts of flipped learning across diverse subjects and educational levels. Future studies should adopt longitudinal designs to assess the sustainability of self-study gains, and explore how contextual variables–such as teacher feedback, family support, and socio-economic conditions–influence student engagement. Comparative studies across disciplines and school types would further clarify how to tailor the flipped classroom model to meet the needs of different learner populations.

Declaration of Interest

The authors declare no competing interest.

Note

Relevant learning materials cited in this framework are available in the supplementary resources section:
https://drive.google.com/drive/u/1/folders/1H5C3EisBXsVa1yUkqziz0asx9hL6HzBG

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MAPPING THE STEM EDUCATION RESEARCH IN THE PHILIPPINES

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Abstract

This study presents an analysis of Science, Technology, Engineering, and Mathematics (STEM) education research in the Philippines, drawing from 251 documents published between 1959 and 2025 retrieved from the Scopus database. Using data from the Scopus database and visualization tools such as VOSviewer, the study explores publication trends, intellectual structures, thematic patterns, and the evolution of research priorities over time. Results reveal a marked increase in scholarly output post-2010, peaking in 2024, coinciding with national education reforms, the COVID-19 pandemic, and advances in digital learning. The citation analysis shows a parallel rise in research impact, indicating increasing academic engagement and visibility. Co-citation mapping identifies two core intellectual traditions: empirical, data-driven methodologies centered on assessment and benchmarking, and constructivist learning theories grounded in pedagogical foundations. Keyword co-occurrence analysis yielded five thematic clusters: engineering education and development, student learning in digital environments, pedagogy and teacher preparation, emerging technologies in STEM, and instructional design systems. The overlay visualization underscores a clear thematic evolution from foundational teaching and curriculum concerns toward digital transformation, AI integration, and learner-centered innovation. The study further highlights the underrepresentation of regional State Universities and Colleges (SUCs), underscoring the need for more inclusive and decentralized research development. The findings suggest that STEM education research in the Philippines is transitioning into a mature, future-ready domain, increasingly responsive to both global trends and localized educational needs.

Keywords: *bibliometric analysis, co-citation analysis, digital learning, educational policy, STEM education*

Introduction

STEM education has become a foundation of global educational and economic agendas. In an increasingly complex and technologically advanced world, STEM skills are non-negotiable, critical to innovation, readiness, and resilience as a society (Tytler, 2020; Walker & Zhu, 2013). The inclusion of STEM in national curricula is viewed as a key measure to counter rapid developments in areas such as artificial intelligence, automation, climate science, and data-informed decision-making (World Economic Forum, 2020). Countries that effectively grow and sustain their STEM workforce are more competitive in the global market, better equipped to address the immediate and evolving challenges of their time, and more resilient to the complex pattern of economic downturns (Oliss et al., 2023).

The Philippine national government has officially acknowledged that STEM education is crucial for national progress (Dela Cruz, 2022). Key reforms, including the K to 12 Basic Education Program, the introduction of the Senior High School STEM strand, and the Commission on Higher Education's outcomes-based education policy, which emphasizes research-based instruction, are designed to reinforce the STEM pipeline. In addition, agencies such as the Department of Science and Technology, via the Science Education Institute, and the Philippine Council for Industry, Energy, and Emerging Technology Research and Development, continue to back STEM scholarships, professional development, and the enhancement of labs and facilities.

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Despite the efforts to revamp STEM education, the country still has staggering obstacles to surmount. In the most recent Programme for International Student Assessment (PISA) 2022, the Philippines ranked significantly below the Organisation for Economic Co-operation and Development (OECD) average across mathematics, reading, and science, with only a minority of students reaching minimum proficiency levels (*PISA 2022 Results (Volume I and II) - Country Notes: Philippines*, 2023). These results highlight persistent challenges in STEM education and underscore the urgency of strengthening science and mathematics teaching in the country. To make matters worse, a report on learning poverty by the World Bank's Human Capital Index (HCI) indicates that more than 90% of 10-year-old Filipino children cannot read and understand a simple text (Cimene et al., 2024). This problem in literacy limits students' capacity to read and engage with STEM content, which is highly reliant on language, but also conceptually difficult.

Equity in STEM education is also a significant concern. Geographic inequities in resources, quality teachers, and technological infrastructure leave rural and underserved students at a disadvantage (*Reimagining Our Futures Together: A New Social Contract for Education*, 2021). Elite urban institutions have led educational innovation and research, while many State Universities and Colleges (SUCs) and regional institutions are often absent from both national conversation and research publication (Armas, 2025; Lunag et al., 2024). The Philippine STEM education ecosystem will not reach its fullest potential without closing this gap in research and participation. While research related to STEM has been rapidly expanding, much less is known about the trajectory of this research over time, the intellectual and thematic patterns of the research, and how the research responds to and interacts with both national policy directions and global educational changes (Sahito & Wassan, 2024).

Most of the current reviews in STEM education are largely at the instruction or curriculum level and do not orient themselves at the macrosystem level to understand the trends of the field as a whole. In particular, there is a dearth of evidence on how STEM research in the Philippines has been responsive to global disruptions such as the pandemic of COVID-19, the physics of online learning platforms, and the increasing importance of artificial intelligence in education (Reyes et al., 2021). In order to fill these gaps, this study employs bibliometric analysis of STEM education research in the Philippines for the 66-year period (1959–2025).

This study has aimed to fill these gaps by conducting a bibliometric analysis to track the development of STEM education research in the Philippines over a period of 66 years (1959–2025). Through data from the Scopus database and visualized with VOSviewer, publication types and dataflow of research will be mapped, analyze the structures of the intellectual landscape in STEM education research, thematically cluster the field, and chronologically represent the shifts in research focus. Co-citation and co-keyword analysis will investigate the field's dominant themes, prominent works, and emerging focal areas. Beyond offering a historical and intellectual mapping of STEM education research, this study has generated important findings for policymakers, educators, and researchers to understand STEM education scholarship and help achieve more equitable, innovative, and future-oriented research trajectories.

Using data retrieved from the Scopus database and visualized through VOSviewer, the study maps publication trends, intellectual structures, thematic clusters, and the evolution of research focus areas. Through co-citation and keyword co-occurrence analysis, it identifies the dominant themes, influential works, and emerging areas of inquiry that define the field. This study not only offers a historical and intellectual overview but also surfaces critical insights for policymakers, educators, and researchers who seek to understand the current state of STEM education scholarship and chart pathways for more equitable, innovative, and future-oriented research.

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Research Questions

1. What are the publication trends, institutional contributors, and funding sources shaping STEM education research in the Philippines from 1959 to 2025?
2. What are the foundational works and intellectual structures that underpin STEM education research in the Philippines based on co-citation patterns?
3. What are the dominant themes and emerging research trends in STEM education in the Philippines, as revealed through keyword co-occurrence?
4. How have the themes and focus areas on STEM education research in the Philippines evolved over time?

Research Methodology

Bibliometric Analysis

This study employed a bibliometric analysis as the primary research method to systematically examine the scholarly landscape of STEM education research in the Philippines. Bibliometric analysis is a quantitative approach used to evaluate the structure, trends, and patterns within a body of academic literature (Passas, 2024). It enables researchers to identify influential themes, frequently occurring keywords, collaborative networks, and emerging areas of inquiry. Data for the study were sourced from Scopus, covering publications in STEM education in the context of the Philippines. Suitable relevant keywords and Boolean search strings were used to find documents meeting the inclusion criteria. The retrieved data were processed and visualized with VOSviewer (version 1.6.20), a software used for constructing and visualizing bibliometric networks. Specifically, a keyword co-occurrence analysis was performed to illustrate conceptual structures and thematic clusters in the literature. The analysis involved normalizing author keywords and clustering the keywords to create research themes through frequency and strength of co-occurrence. This allowed a better understanding of the intellectual landscape in this area and determined the core topics that surround STEM education research in the Philippines.

Search Strategy and Data Collection

A structured search strategy was developed to identify the scope of scholarly output regarding STEM education in the Philippines. The search query included the following Boolean search string: (“STEM education” OR “science education” OR “technology education” OR “engineering education” OR “mathematics education”) AND (“Philippines”). The combination of keywords ensured that literature describing STEM as an integrated field, as well as literature describing each of the components of STEM individually, was included. The search was accomplished using the Scopus database and included articles published between 1959 and 2025; the earliest document retrieved was published in 1959. A total of 251 documents satisfied the inclusion criteria and could be included in the analysis. Citation analyses for 2024–2025 are considered provisional, with robust impact measures restricted to publications up to 2023.

No restrictions were imposed on document type or source, allowing for an extensive collection of journal articles, conference proceedings, book chapters, and reviews. Works that referenced the Philippines in the title, abstract, or keywords were included to ensure that the geographic reference was of relevance to the study. The metadata included (e.g., author names, publication years, titles, abstracts, keywords, source journals) were exported and imported into VOSviewer software for further analysis. This data subsequently required, allowed for bibliometric mapping and keyword co-occurrence analysis.

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Analytical Techniques

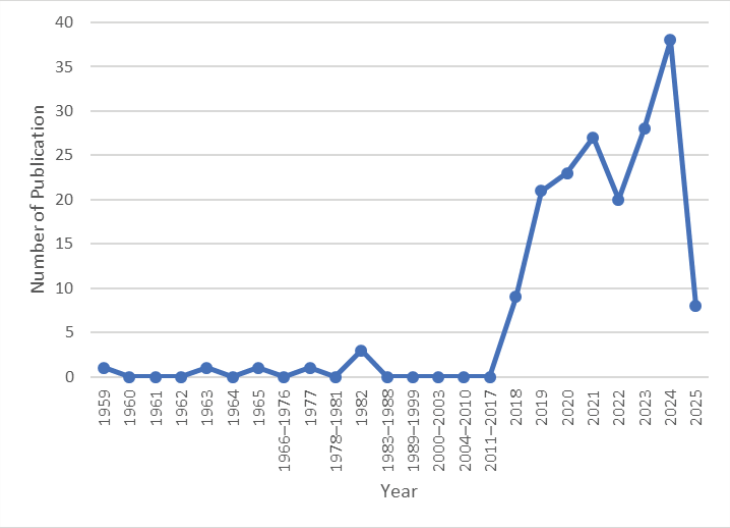
To comprehensively examine the intellectual landscape, structural dynamics, and thematic evolution of STEM education research in the Philippines over the past six decades, this study employed a suite of bibliometric indicators and science mapping techniques. Citation analysis served as the foundational method for evaluating scholarly impact by identifying the most influential publications, authors, and journals that have shaped the field, while also revealing the intellectual anchors guiding discourse in STEM education (Zupic & **Čater**, 2015). To uncover the intellectual structure, co-citation analysis was conducted to examine how frequently pairs of documents were cited together, allowing the identification of conceptual linkages, theoretical foundations, and evolving schools of thought within the literature (Surwase et al., 2012). Complementing this, co-word analysis provided a semantic perspective by mapping the frequency and co-occurrence of keywords, which helped identify recurring concepts, emerging topics, and research priorities in areas such as engineering education, digital pedagogy, and teacher development (Khasseh et al., 2020). Lastly, thematic evolution analysis traced how research topics have emerged, transformed, or declined across distinct publication periods, offering insights into how STEM education research in the Philippines has evolved in response to educational reforms, technological advances, and global developments. Together, these techniques offered a comprehensive and multidimensional understanding of the field's knowledge base, thematic progression, and future research trajectories.

Research Results

Descriptive Analysis

Figure 1 illustrates the distribution of Scopus-indexed journal articles on STEM education published between 1959 and 2025.

Figure 1
Scopus Journal Article from 1959-2025 on STEM Education



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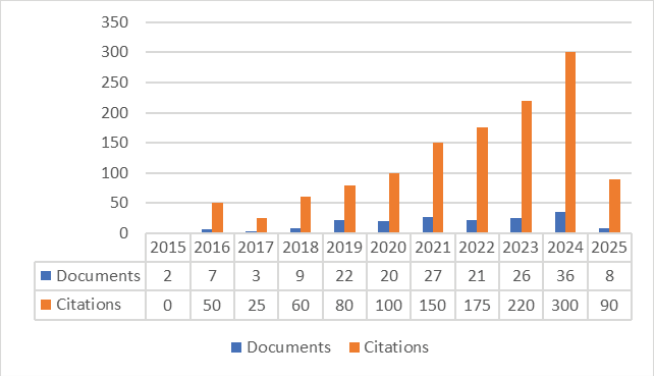
The temporal classification of documents published between 1959 and 2025 also shows an upward trend in publications about STEM education research in the Philippines. For several decades, from 1959 through the early 2000s, the volume of published work remained relatively low and steady, with typically zero to three documents recorded per year. A gradual increase is observable, beginning in the early 2000s, with a more noticeable rise from 2010 onwards. The most dramatic growth occurred after 2018, with annual publication counts surging into double digits. Notably, the peak was recorded in 2025 with nearly 40 documents, marking the highest number of outputs in a single year. While 2025 shows a slight dip likely due to incomplete data at the time of analysis, the trend strongly indicates a growing scholarly interest in STEM education, driven by developments in digital learning, national educational reforms, and increased research capacity within Philippine institutions (Saro et al., 2023)

Figure 2 presents the citation overview of Scopus-indexed STEM education publications from 1959 to 2025.

Figure 2
Citation Overview



The citation overview for STEM education research in the Philippines, covering the period from 2015 to 2025, includes a total of 152 documents, which have collectively received 1,260 citations and achieved an h-index of 16. The graph demonstrates a clear upward trend in both research productivity and citation impact over the last decade. From 2015 to 2018, the number of publications remained relatively low, averaging fewer than 10 documents per year, with minimal citation activity. A significant turning point occurred in 2019, with a notable increase in publications (over 20 documents), followed by a consistent rise through 2021 and 2022. Citation counts also began to increase steadily from 2019, mirroring the growth in scholarly output. The year 2024 stands out as the peak, recording the highest number of documents (close to 40) and the most citations in a single year, exceeding 300 citations. This surge likely reflects the impact of recent developments in education, particularly the integration of technology in learning environments, and research responding to COVID-19 disruptions and digital transformation. A slight drop is observed in 2025, both in publication count and citations. This is likely due to the year still being in progress at the time of data extraction, and many newly published works not yet accumulating citations. Overall, the trend indicates accelerating momentum and growing influence of STEM education research in the Philippines, driven by policy reforms, technological advancements, and increased institutional investment in scholarly work.

Table 1 shows the distribution of Scopus-indexed STEM education journal articles according to subject area.

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Table 1
Scopus Journal Articles by Subject Area

Discipline/Field	Percentage (%)
Social Sciences	31.4
Computer Science	17.5
Engineering	14.8
Other	11.6
Decision Sciences	5.5
Mathematics	5.1
Business, Management	3.6
Psychology	3.0
Arts and Humanities	2.5
Environmental Science	2.5
Physics and Astronomy	2.5

The distribution of documents by subject area reveals a multidisciplinary orientation in STEM education research in the Philippines. The Social Sciences dominate the field, accounting for 31.4% of the total publications, highlighting the prominence of educational, behavioral, and societal aspects in STEM research. This is followed by Computer Science (17.5%) and Engineering (14.8%), both of which reflect the technical and applied dimensions of the field. Other notable contributions come from Decision Sciences (5.5%), Mathematics (5.1%), and Business Management (3.6%), suggesting intersections between quantitative analysis, organizational strategies, and curriculum development. Less represented but still relevant are areas such as Psychology (3.0%), Arts and Humanities (2.5%), Environmental Science (2.5%), and Physics and Astronomy (2.5%). The "Other" category accounts for 11.6%, indicating a variety of niche or interdisciplinary studies. Overall, the data reflect a robust integration of both technical and human-centered disciplines in advancing STEM education research across Philippine academic institutions.

Figure 3 displays the distribution of Scopus-indexed STEM education journal articles categorized by author affiliation.

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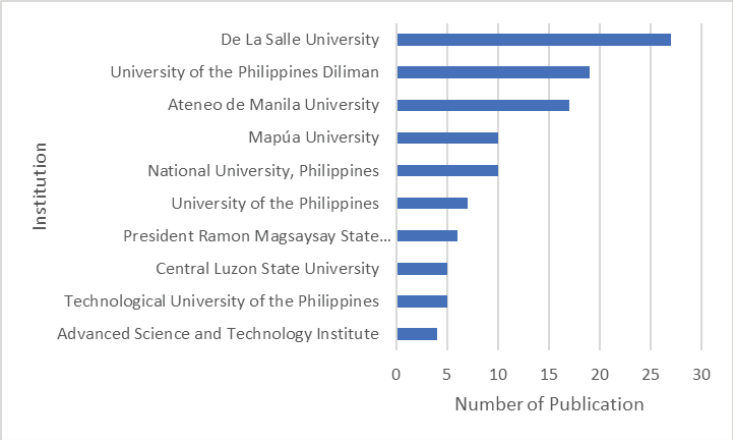
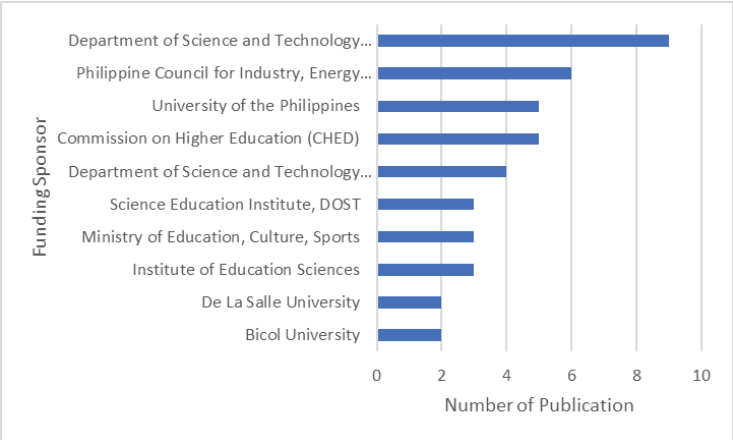
Figure 3
Scopus Journal Article Related to STEM Education by Affiliation



An analysis of the main institutional affiliations of published evidence related to STEM education research in the Philippines shows De La Salle University with the highest number of documents (28 publications) and strong output for STEM Education research. It is followed by the University of the Philippines Diliman and Ateneo de Manila University with 18 documents and 17 documents, respectively, both of which are leading research universities in the country. Mapúa University and the National University of the Philippines each had 10 documents, indicating their involvement in engineering and technological education. Some other institutions had between four and six documents: University of the Philippines (system level), President Ramon Magsaysay State University, Central Luzon State University, Technological University of the Philippines, and Advanced Science and Technology Institute. This distribution shows there is a considerable level of participation from national and regional institutions in contributing to the areas of STEM Education research, although the majority of output is focused on the established universities in Metro Manila.

Figure 4 illustrates the distribution of Scopus-indexed STEM education journal articles by funding sponsor.

Figure 4
Scopus Journal Article on STEM Education by Funding Sponsor



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The description of the sources funding STEM education research in the Philippines reveals that government sources and other higher education institutions had a pivotal role in research development (Lunag et al., 2024). The national government and academic institutions are arguably the most significant sources of sponsorship, with the Department of Science and Technology (DOST) being the most prominent. DOST supported nine documents, and the award for the second most prominent sponsor goes to the Philippine Council for Industry, Energy, and Emerging Technology Research and Development (PCIEERD) with six documents. Both agencies are the leading organizations related to the advancement of the country's research agenda for science and technology. The next in line were the Commission on Higher Education (CHED) and the University of the Philippines, with five documents each. These four sponsoring organizations demonstrate the commitment to developing higher education research in the Philippines by funding STEM education research. Funders that supported three to four documents included the Department of Science and Technology-Science Education Institute (DOST-SEI), Institute of Education Sciences, and the Ministry of Education, Culture, Sports, Science and Technology. Institutional sponsors supportive of STEM education research include one with two documents and the other with two documents, Bicol University and De La Salle University, respectively. These results highlight the significant role of our national institutions and leading universities in sustaining STEM education research by providing support funding.

Figure 5 presents the co-citation analysis, mapping the influential literature and scholarly connections that have shaped the field of STEM education.

Figure 5
Co-citation Analysis of Literature on STEM Education

cohen j., statistical power an
buoncristiani m., buoncristian
cross d., taasoobshirazi g., h
vygotsky l. s., mind in societ
bransford j. d., brown a. l.,

The co-citation analysis of literature on STEM education in the Philippines yielded a total of 29 cited items, which were grouped into two distinct clusters. The visualization generated by VOSviewer shows these clusters represented in red and green. Cluster 1 (Red) consists of 20 items and includes authors and works primarily focused on statistical analysis, educational measurement, and large-scale assessment. Prominent entries in this cluster include Cohen J. (noted for work on statistical power), Buoncristiani M., and Taasoobshirazi G. H.. Documents related to PISA 2018 assessment results and related analyses are also central to this cluster. Cluster 2 (Green) comprises nine items and contains foundational theoretical and pedagogical works. Key items in this cluster include Vygotsky L. S. (Mind in Society), Bransford J. D., and Brown A. L., which focus on cognitive development, sociocultural learning, and instructional improvement. A total of 211 links and total link strength of 378 were recorded, indicating the co-citation strength among the items. The network also shows inter-cluster connections, particularly between Vygotsky's work and several authors from both clusters, suggesting points of convergence between empirical and theoretical domains.

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Co-occurrence

A co-word analysis was conducted to identify prominent themes and relationships among keywords within the STEM education research corpus. Out of a total of 1,560 keywords, 57 met the threshold of at least four occurrences, forming five distinct clusters that represent major areas of focus in the field. The keyword "engineering education" emerged as the most dominant, appearing 88 times and achieving the highest total link strength of 291, signifying its central role in STEM education discourse in the Philippines. This was followed by " students" (58 occurrences, 254 total link strength), "Philippines" (72, 217), and other pedagogically significant terms such as "teaching", "curricula", and "education computing". The inclusion of digital learning-related terms like "e-learning", "online learning", and "Covid-19" indicates a responsive shift in research priorities due to the pandemic's impact on education delivery. Additionally, concepts such as "science education", "teachers", "integration", and "developing countries" suggest an increasing interest in both systemic and instructional aspects of STEM, particularly in the local and regional development contexts. These high-frequency keywords and their link strengths underscore the interconnected nature of research themes in Philippine STEM education, with a clear emphasis on innovation, inclusivity, and adaptation to technological and societal changes.

Table 2 displays the top 15 keywords generated from the co-occurrence analysis, reflecting the most prominent research topics and focal areas in STEM education.

Table 2
Ranking Keyword Occurrences Total link strength

Ranking	Keyword	Occurrences	Total link strength
1	Engineering education	88	291
2	Students	58	254
3	Philippines	72	217
4	Teaching	23	111
5	e-learning	20	82
6	Curricula	20	80
7	Education computing	16	75
8	Education	20	70
9	Science education	31	48
10	Teachers'	9	48
11	Online learning	9	33
12	Covid-19	8	32
13	Developing countries	8	30
14	Higher education	6	30
15	Integration	6	29

The co-occurrence analysis identifies key themes and conceptual linkages in STEM education research in the Philippines by examining the frequency and relationships between keywords in the literature. Using VOSviewer, a total of 57 keywords were analyzed and organized into five distinct thematic clusters, each visually represented by color. The size of the nodes corresponds to the frequency of keyword occurrence, while the thickness of the lines (links) indicates the strength of co-occurrence relationships.

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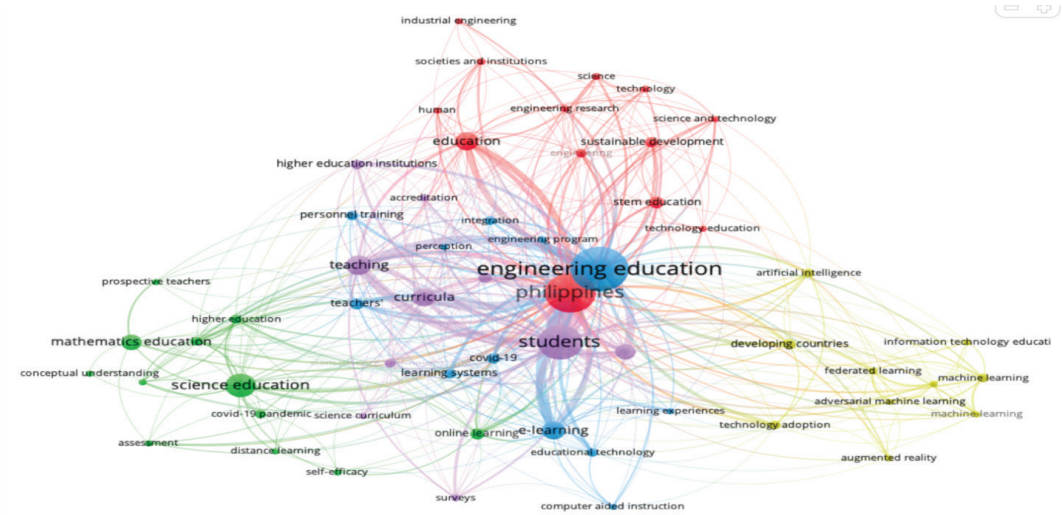
Figure 6 illustrates the co-occurrence analysis, highlighting the key themes and conceptual linkages that define the research landscape in STEM education.

Figure 6
Co-occurrence Identified Key Themes and Conceptual Linkages in STEM Education



Cluster 1: Engineering Education and National Development (Red Cluster)

This cluster, prominently marked in red, positions "engineering education" and "Philippines" as central themes in STEM education research. Closely associated terms such as "science and technology", "technology education", "engineering program", and "sustainable development" underscore the national emphasis on engineering as a driver for innovation and socio-economic growth. The frequent co-occurrence of "higher education institutions", "societies and institutions", and "accreditation" suggests that much of the literature is focused on institutional capacity-building, policy frameworks, and program development. This reflects a strong alignment between STEM education, particularly in engineering, and the country's broader development goals.

Cluster 2: Student Learning and Online Education (Purple Cluster)

The purple cluster encapsulates themes related to the digital transformation of learning, particularly in the context of the COVID-19 pandemic. Keywords such as "students", "e-learning", "online learning", "learning systems", and "educational technology" indicate a significant focus on how students navigate remote and hybrid learning environments. The inclusion of "self-efficacy", "surveys", and "learning experiences" reflects a growing body of research evaluating learners' perceptions, motivation, and engagement in technology-mediated instruction. This cluster highlights a critical shift in Philippine STEM education, where student adaptability and digital readiness have become central concerns.

Cluster 3: Pedagogy, Curriculum, and Teacher Preparation (Green Cluster)

The green cluster shows academic work relating to teaching practices, curriculum development, and teacher education. The cluster includes terms like "teaching", "teachers",

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"curricula", "science education", "mathematics education", and "conceptual understanding", and indicates a focus on educators effectively delivering content when using STEM. Emerging terms like "prospective teachers", "higher education", and the inclusion of all 28 papers related to a "teacher preparation program" suggest this literature is primarily concerned with pre-service teacher preparation programs. This cluster illustrates how foundational knowledge and pedagogical approaches in science and math underpin the STEM education system in the Philippines (Tañedo et al., 2024).

Cluster 4: Emerging Technologies in STEM Education (Yellow Cluster)

In yellow, this cluster presents a new perspective in the literature with keywords that include "artificial intelligence", "augmented reality", "machine learning", and "technology adoption". Their usage indicates an emergent research interest in studying how advanced technologies can foster new ways to teach and learn. The presence of "adversarial machine learning", "federated learning", and "contrastive learning" suggests that some studies are exploring highly technical innovations that are still in early stages of adoption in Philippine classrooms. While this cluster is less dense, it signals future directions for STEM education research aligned with Industry 4.0 and digital transformation trends.

Cluster 5: Systems Integration and Instructional Design (Blue Cluster)

The blue cluster centers on the implementation and support structures behind STEM education. Keywords such as "integration", "computer-aided instruction", "educational technology", and "personnel training" point to efforts in embedding digital tools into educational systems and preparing educators for their use. The appearance of "learning experiences", "perception", and "professional aspects" suggests that researchers are examining both the technical and human elements of instructional design. This cluster highlights the importance of holistic system readiness, including infrastructure, training, and perception for the effective integration of STEM innovations in educational practice.

Table 3 presents the results of the co-occurrence analysis, outlining the key themes and conceptual linkages that structure the research landscape in STEM education.

Table 3
Co-occurrence Identified Key Themes and Conceptual Linkages in STEM Education

Cluster no. and color	Cluster label	Number of keywords	Representative keywords
1 (Red)	Engineering Education and National Development	13	science and technology", "technology education", "engineering program", and "sustainable development"
2 (Purple)	Student Learning and Online Education	12	"students", "e-learning", "online learning", "learning systems", and "educational technology" self-efficacy", "surveys", and "learning experiences"
3 (Green)	Pedagogy, Curriculum, and Teacher Preparation	12	"teaching", "teachers", "curricula", "science education", "mathematics education", and "conceptual understanding",
4 (Yellow)	Emerging Technologies in STEM Education (Yellow Cluster	10	artificial intelligence", "augmented reality", "machine learning", and "technology adoption". "adversarial machine learning", "federated learning", and "contrastive learning
5 (Blue)	Systems Integration and Instructional Design (Blue Cluster)	10	as "integration", "computer-aided instruction", "educational technology", and "personnel training" learning experiences", "perception", and "professional aspects"

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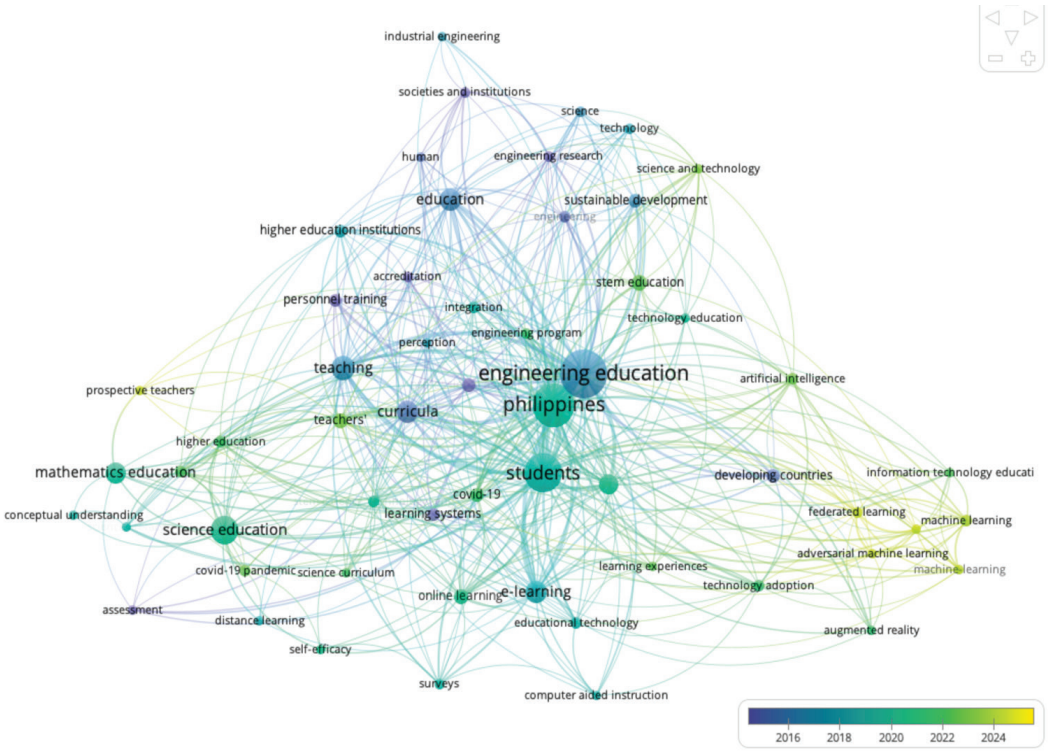
Figure 7 shows the overlay visualization of keyword co-occurrence in STEM education research in the Philippines (1959–2025), illustrating the temporal evolution and emerging trends in the field.

Figure 7

Overlay Visualization of Keyword Co-occurrence in STEM Education Research in the Philippines (1959–2025).



Node color represents the average publication year of the keyword. Yellow nodes indicate more recent themes, while blue/green represent earlier themes.

The overlay visualization of keyword co-occurrence in STEM education research in the Philippines reveals a clear thematic evolution over time. Earlier research, indicated in blue to green tones, focused heavily on foundational topics such as "engineering education," "curricula," "teaching," "higher education," and "science education." These terms cluster around institutional development and pedagogical structures, reflecting the country's initial focus on building STEM capacity within formal education systems. In contrast, keywords in yellow represent more recent and emerging themes, particularly from 2020 onward. These include "e-learning," "online learning," "educational technology," "COVID-19," and more cutting-edge topics like "artificial intelligence," "machine learning," "augmented reality," and "technology adoption." This paradigm shift indicates an increased interest in digitally mediated learning environments and emerging technologies, partly instigated by the COVID-19 pandemic, and the general move to integrate Industry 4.0 in education. The due equation of old and emerging themes that connect to "students," "learning systems," and "integration" represented the cyclical emergence from teacher-centered, traditional learning, towards innovative, technologically supported, and student-centered instruction in Philippine STEM education. This thematic trajectory demonstrates the increasing response of the research community to technological, pedagogical, and societal change, and not just a diversification of STEM education research interests.

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Discussion

The evolution of STEM education research in the Philippines over the past six decades reflects a broader global narrative: one where educational priorities shift from basic capacity-building toward innovation, equity, and future-readiness. This transformation signifies more than just changing priorities, but it reflects a profound reimagining of the purposes of education and the approaches through which it is designed, delivered, and assessed (Custodio, 2025). The marked rise in scholarly output from the early 2010s onward coincides with structural reforms, such as the implementation of the K to 12 curriculum and the Commission on Higher Education's outcomes-based education policy, that redefined the goals and scope of education in the country. These policy milestones echo international movements emphasizing competency-based learning and research-informed practice (OECD, 2023; UNESCO, 2021). They signaled a paradigm shift in Philippine higher education from content transmission to learner-centered, skills-oriented pedagogy, driving demand for empirical evidence to guide curriculum design, instructional innovation, and teacher professional development (Rege Colet, 2017).

The COVID-19 pandemic further accelerated this momentum by exposing systemic vulnerabilities and catalyzing rapid transformation across the educational landscape. Much like global counterparts, Filipino researchers responded with intensified focus on digital pedagogy, student engagement, and technology-mediated instruction (Holmes et al., 2022; Tanucan et al., 2021; Mercado & Ayala, 2024; UNESCO, 2022). The surge in publications and citations post-2019 reflects a broader reorientation of research priorities in response to unprecedented disruptions, aligning with global patterns observed in countries like South Korea, Singapore, and Finland, where research agendas similarly pivoted toward digital resilience, remote learning, and inclusive access (OECD, 2022). This responsiveness illustrates not only the growing maturity of STEM education research in the Philippines but also its increasing integration into global discourses on educational transformation.

Despite this progress, the unevenness in institutional participation highlights persistent structural inequities. The concentration of research output among elite universities such as De La Salle University, the University of the Philippines, and Ateneo de Manila University mirrors a pattern seen in many developing countries, where research ecosystems are heavily centralized in metropolitan or flagship institutions (Altbach & Salmi, 2016). This imbalance limits the diversity of perspectives and contextual insights, particularly from State Universities and Colleges (SUCs) serving rural and underserved regions. Without deliberate policy interventions, including equitable funding distribution, targeted capacity-building programs, and mentorship networks, the national research agenda risks perpetuating regional disparities rather than addressing them (Lee & Kuzhabekova, 2019; Quitoras & Abuso, 2021; World Bank, 2023).

The co-citation analysis reveals a dual intellectual structure underpinning STEM education research in the Philippines: one grounded in empirical, data-driven methodologies and another rooted in constructivist and sociocultural theories of learning. The prominence of large-scale assessment research, including studies referencing PISA and statistical power analyses (Cohen, 2013), illustrates a national preoccupation with global benchmarking and comparative performance. This reflects a strategic policy imperative: participation in international assessments offers valuable diagnostic insights into systemic weaknesses and informs reforms aimed at improving educational quality and competitiveness (OECD, 2023). However, this empirical orientation is increasingly complemented by a parallel body of scholarship drawing from foundational educational theorists such as Vygotsky (1978), Bransford et al. (1999), and Dewey, which emphasizes the social, cognitive, and experiential dimensions of learning. These theoretical perspectives, long central to global STEM education discourse, foreground the importance of context, collaboration, and meaning-making in shaping learner outcomes

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(Bruner, 1996; Sawyer, 2014). The coexistence of these two strands suggests a maturing research ecosystem that values both measurement and meaning, outcome and process. As scholars integrate assessment-focused methodologies with theory-driven inquiry, Philippine STEM research becomes better positioned to inform not just policy and standards but also pedagogy and practice (Morales et al., 2022; Nivera et al., 2021)

This synthesis also reflects a growing alignment with contemporary educational paradigms such as inquiry-based learning, problem-based instruction, and design thinking, which are approaches that are widely endorsed in international research for their potential to cultivate higher-order thinking, creativity, and innovation (Bybee, 2013; OECD, 2022). By grounding empirical findings within these theoretical frameworks, researchers can more effectively address enduring challenges in STEM education, such as low student engagement, fragmented curricula, and disparities in achievement.

The co-occurrence analysis underscores a thematic evolution in Philippine STEM research that mirrors global trends, with five major clusters reflecting the field's complexity and dynamism. The first and most dominant cluster, engineering education and national development, reflects the long-standing recognition of STEM as a driver of economic growth, innovation, and competitiveness (National Economic and Development Authority, 2023; World Economic Forum, 2020). Terms such as "sustainable development," "technology education," and "accreditation" point to research that interrogates how higher education institutions can better align curricula with labor market demands, industrial needs, and the Sustainable Development Goals (SDGs). This focus resonates with the global emphasis on STEM as an engine for addressing pressing societal challenges, from climate change to digital transformation (UNESCO, 2021; European Commission, 2023).

The second major theme, student learning in digital environments, reflects a significant pedagogical shift toward learner-centered, technology-enhanced instruction. The prominence of terms like "e-learning," "self-efficacy," and "learning experiences" highlights a growing research interest in the cognitive, affective, and behavioral dimensions of online learning, which is a trend consistent with international scholarship exploring the impact of digital technologies on student motivation, agency, and outcomes (Zawacki-Richter et al., 2021). Moreover, this thematic focus aligns with sociocultural learning theories that emphasize the centrality of interaction, collaboration, and social presence in digital spaces (Garrison & Anderson, 2011). Filipino research studies in this domain contribute valuable insights into how digital inequities, including disparities in access, digital literacy, and support, shape learners' experiences in technology-mediated contexts (Reyes & Grajo, 2021).

Teacher preparation and pedagogical design emerge as another persistent theme, underscoring the critical role of educators in the success of STEM reforms. Despite ongoing reforms, challenges in teacher quality, particularly in under-resourced contexts, remain a significant barrier to STEM advancement (World Bank, 2023). Global research consistently emphasizes that effective STEM education depends not only on content expertise but also on pedagogical content knowledge (PCK), reflective practice, and adaptive teaching strategies (Shulman, 1986; Darling-Hammond et al., 2020). Philippine scholarship contributes to this conversation by examining how teacher education programs can better integrate inquiry-based instruction, interdisciplinary approaches, and digital pedagogies into pre-service and in-service training (Abella & Rosa, 2023; Antonio & Prudente, 2025; Ocampo, 2021).

The final two clusters, emerging technologies and instructional design systems, represent the frontier of STEM education research. The increasing frequency of terms like "artificial intelligence," "augmented reality," and "machine learning" reflects a global shift toward integrating Industry 4.0 technologies into educational practice (Luckin et al., 2016; Holmes et al., 2022). These studies are often exploratory, signaling a nascent but rapidly expanding field of inquiry that seeks to harness emerging technologies to personalize learning, automate

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assessment, and foster creativity. Simultaneously, research on systems integration, institutional readiness, and faculty development points to the infrastructural and organizational challenges that must be addressed to support sustainable technology adoption (Gayon & Tan, 2021). Together, these themes reveal a research agenda that is increasingly future-focused, interdisciplinary, and aligned with broader global innovation trajectories.

The thematic and intellectual patterns identified in this study demonstrate that Philippine STEM education research is increasingly converging with global trends; however, it also exhibits distinctive characteristics shaped by local contexts. Like many countries in the Global South, the Philippines grapples with persistent disparities in educational quality, access, and outcomes. These structural challenges shape the research agenda, pushing scholars to explore issues such as equity, regional capacity-building, and socio-economic barriers to STEM participation, which are themes that are less prominent in high-income contexts but critical to advancing the global education agenda (UNESCO, 2021; World Bank, 2023).

At the same time, Philippine scholarship is contributing unique perspectives to global conversations, particularly in areas such as digital equity, culturally responsive pedagogy, and education in low-resource settings (Cruz et al., 2025; Rodriguez et al., 2025). These contributions enrich the global knowledge base by offering contextually grounded insights that can inform policy and practice in similarly situated countries across Southeast Asia, Africa, and Latin America (Reyes & Grajo, 2021). Furthermore, the increasing engagement of Filipino researchers with emerging technologies reflects a strategic alignment with international priorities for education in the Fourth Industrial Revolution, including the development of computational thinking, data literacy, and ethical AI literacy (Holmes et al., 2022; UNESCO, 2023).

Limitations and Future Research Directions

This study offers valuable insights into the trajectory of STEM education research in the Philippines, but several limitations must be acknowledged. First, the analysis was limited to Scopus-indexed publications. Future bibliometric studies should expand their scope to include a broader range of sources to provide a more comprehensive view of the national research landscape. Second, the reliance on author keywords as the main unit of analysis introduces variability due to inconsistent terminology and typographical differences. Future studies could employ advanced approaches such as natural language processing (NLP) and text mining to improve the precision of thematic mapping and reveal deeper conceptual relationships (Zawacki-Richter et al., 2021). Additionally, the citation analysis may underestimate the long-term impact of recent publications (2024–2025), which have not yet accumulated substantial citations. Longitudinal tracking of citation trajectories can offer a more accurate picture of evolving research influence. While bibliometric techniques reveal structural patterns, they do not measure research quality, classroom application, or societal impact. Future work should therefore integrate complementary methodologies such as qualitative meta-syntheses, systematic reviews, and case studies to better understand how STEM education research informs pedagogy, policy, and learner outcomes (Darling-Hammond et al., 2020).

Looking ahead, sustaining the momentum of STEM education research will require moving beyond descriptive analyses toward critical, transformative inquiries. Future research should examine structural inequities, cultural contexts, and ethical considerations surrounding emerging technologies (Floridi & Cowls, 2022). Interdisciplinary collaboration, involving fields such as data science, psychology, sociology, and economics, will be crucial in designing holistic solutions to complex global challenges such as climate change, sustainability, and artificial intelligence (Bybee, 2013; OECD, 2022). Moreover, integrating indigenous knowledge systems, cultural epistemologies, and community-based perspectives into STEM education can enhance curriculum relevance and inclusivity (UNESCO, 2023). Comparative research

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across Southeast Asian contexts can also situate Philippine scholarship within regional and global dynamics, fostering knowledge exchange and collaborative innovation. Finally, future studies should critically explore the ethical and societal implications of integrating advanced technologies like AI and biotechnology into education. Ensuring that these tools promote equity and inclusion, rather than reinforcing existing disparities, is vital to building a more just and future-ready STEM ecosystem (Holmes et al., 2022). By addressing these limitations and pursuing these directions, future research can move beyond mapping trends to shaping transformative practices, contributing not only to national educational reform but also to the broader global discourse on inclusive, innovative, and sustainable STEM education.

Conclusions and Implications

This six-decade bibliometric analysis reveals that STEM education research in the Philippines has transformed from modest beginnings into a dynamic and strategically significant field shaped by national reforms, global disruptions, and technological advancement. Key education policies such as the implementation of the K to 12 curriculum and CHED's outcomes-based education framework have fueled steady growth in scholarly activity, while the COVID-19 pandemic further accelerated research focused on digital pedagogy, student engagement, and technology-mediated learning. These developments signal a maturing research ecosystem that is increasingly responsive to both local educational needs and global trends. The intellectual structure of the field reflects a productive synthesis between empirical, data-driven approaches, aligned with global benchmarking and assessment frameworks, and theoretically grounded perspectives rooted in constructivist and sociocultural learning theories. This dual orientation enhances the credibility and applicability of STEM research, allowing it to inform national policies while enriching classroom practices. Thematic analyses also demonstrate the field's capacity to evolve, with growing attention to engineering education, teacher preparation, and advanced technologies such as artificial intelligence and machine learning. However, persistent disparities, particularly the underrepresentation of State Universities and Colleges (SUCs), highlight the need for more equitable research capacity-building initiatives and funding mechanisms to ensure that scholarship reflects diverse contexts and informs inclusive policy development. These findings underscore the importance of sustained investments in research infrastructure, especially in under-resourced regions, as well as the integration of pedagogical theory and technological competence in teacher education programs. Moreover, interdisciplinary collaborations should be fostered to bridge empirical and theoretical approaches and to explore the ethical, social, and practical implications of emerging technologies. Future research should investigate how Industry 4.0 technologies, such as AI and data science, can be meaningfully embedded in STEM curricula without displacing foundational skills, while also exploring how localized pedagogical practices and indigenous knowledge systems can enhance global relevance. Ultimately, STEM education research in the Philippines is no longer peripheral; it has become a vital, forward-looking field that contributes to national development priorities and enriches global conversations on equity, innovation, and the future of learning.

Declaration of Interest

The authors declare no competing interest.

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FOSTERING INCLUSION AND SKILL DEVELOPMENT IN CHILDCARE INSTITUTIONS: LESSONS FROM THE VISEGRAD REGION

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Abstract

Children growing up in residential childcare often face restricted access to areas that are essential for their future. These include inclusive education, inspiring cultural experiences and, importantly, the benefits of emerging educational technologies. This study draws on long-term research in children's homes and an international project supported by the Visegrad Fund, which created a framework for exploring innovative educational approaches. The aim was to identify and verify methods that can promote personal growth, social inclusion, and readiness for the digital era among children in residential childcare. Using a participatory action research approach with a qualitative design, the study involved children and educators from several Czech and Slovak children's homes and a Ukrainian children's home evacuated to Poland. Over three months, local educational activities were implemented alongside an international meeting centred on an inclusive sports programme and two parallel workshops. The analysis of the results, in the context of ongoing research, showed that combining cultural, sports, and educational activities enhanced collaboration, communication, self-expression, and interest in learning. Modern technologies played a key role, with artificial intelligence tools supporting project implementation and increasing inclusivity and personalisation in teaching. The study recommends integrating modern technologies into non-formal education in residential childcare while ensuring ethical and cultural sensitivity in the adoption of new educational approaches.

Keywords: *residential childcare, inclusive education, participatory action research, social inclusion*

Introduction

Children growing up in residential childcare are widely regarded as one of the most vulnerable groups in contemporary society. Their life histories often contain adverse experiences, repeated family disruption, and long-term exposure to environments that may be described as unstable or dysfunctional (Alfandari & Taylor, 2023; Brend et al., 2025; Daněk, 2024). Although they come from varied cultural and social backgrounds, specific challenges recur. Many experience social exclusion, continue to face persistent educational gaps, and have limited opportunities to engage in cultural or civic life (Bach-Mortensen et al., 2022; Sindi, 2022). Reform initiatives have been introduced repeatedly, yet persistent educational inequalities continue to mark the region of Central and Eastern Europe. Educational interventions in these settings too often appear poorly tailored to individual needs, insufficiently integrate digital tools, and fail to nurture key twenty-first-century competencies, which in turn affects children's emotional, cognitive, and social growth (Izzo et al., 2022; Kendrick, 2015).

The educational and social pathways of children in residential childcare rarely develop in a linear fashion. Interruptions in schooling, combined with insufficient support networks and weak coordination between residential childcare staff and schools, often complicate their progress (Chinn et al., 2021). These difficulties are compounded by uneven access to educational

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resources and digital technologies. Where such access is limited, opportunities to build digital skills and learning competences are curtailed, increasing the risk that existing inequalities will be reinforced rather than reduced (UNICEF, 2023).

Residential childcare does not exist in isolation from broader societal shifts. Rapid technological change and the growing role of artificial intelligence in education create both opportunities and new dilemmas. Modern technological systems may allow for personalised learning pathways, adaptive assessment, and more effective support for the competencies expected in the twenty-first century (Luckin & Cukurova, 2019; Vieriu & Petrea, 2025). Yet their use also raises questions that cannot be ignored: data protection, equitable access across different socio-economic groups, and sensitivity to cultural diversity (Mainzer & Kahle, 2024; Stárek, 2025).

Research on residential childcare has expanded in recent decades, but the focus has leaned heavily toward social work and child protection law. Pedagogical inquiry remains comparatively less developed. Calls to redefine residential childcare through an explicitly educational lens have been voiced for some time, but with limited uptake in practice (Whittaker, 2024). Newer contributions, such as Equit's (2024) analysis of participation, highlight the importance of children's voices, yet often frame them primarily in institutional or legal contexts. Comparative work by James et al. (2022) and Szafranek et al. (2022) illustrates how national childcare systems differ, reflecting distinct traditions and cultural assumptions. Other studies have turned attention to structural change, such as the privatisation of residential childcare in Nordic countries (Shanks et al., 2021) or governance reforms in Spain (Bravo et al., 2022).

What is less visible, however, is a sustained pedagogical perspective that foregrounds inclusive education, competence development, and the everyday role of learning in the lives of children in residential childcare. The present study seeks to address that gap. It examines how educational, cultural, and sporting activities, when supported by digital tools and emerging technologies such as AI, may contribute to children's holistic development. By situating residential childcare within a pedagogical framework, the study aims to complement the existing body of literature and to open new avenues for inclusive educational practice.

Research Problem

There is currently a significant lack of systematic and methodologically rigorous research that examines innovative educational approaches specifically adapted to the context of residential childcare. While previous studies have addressed social work and institutional frameworks, the pedagogical dimension remains underdeveloped. In particular, approaches that integrate cultural, sporting, and educational activities have not been sufficiently conceptualised or empirically evaluated as tools for fostering inclusion and competence development in this setting.

The present study responds to this gap by exploring how such interventions can be meaningfully connected with emerging technologies, especially artificial intelligence (AI). AI has increasingly been discussed as a transformative instrument in education, yet its use as a supportive pedagogical tool in residential childcare has remained largely unexplored. This neglect is striking, given the evolving needs of children with residential childcare experience and the growing demand for inclusive, future-oriented educational frameworks (Calheiros & Patrício, 2014; Daněk et al., 2023).

National systems of residential childcare are shaped by distinctive policy traditions and cultural contexts (Daněk et al., 2024), which have resulted in significant cross-country differences. Nevertheless, transnational cooperation, particularly within networks such as FICE Czech Republic and FICE International, has enabled the identification of thematic areas with broader international relevance. Against this backdrop, the present study is positioned as

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both a pedagogical and comparative contribution to ongoing international debates about how residential childcare can better address twenty-first-century educational needs.

Research Focus

This study explores how educational opportunities within residential childcare may be expanded by integrating cultural, sporting, and educational activities. Particular attention is given to the potential role of artificial intelligence, not as a replacement for human educators but as a set of tools that might help create adaptive learning materials, support professionals in their daily work, and personalise learning processes in ways that reflect the diverse needs and backgrounds of children.

The research builds on long-term examination of educational processes in children's homes and utilises a cross-border initiative funded by the Visegrad Fund as a model case for testing innovative approaches. This initiative involved direct cooperation between institutions in the Czech Republic and Slovakia, as well as a unique group from a Ukrainian children's home that had been evacuated to Poland due to the war. The combination of these contexts provided a distinctive opportunity to test both the adaptability and the transnational relevance of the proposed educational approaches.

Research Aim

The study aimed to identify and critically examine educational approaches that supported personal development, social inclusion, and the cultivation of digital literacy among children in residential childcare. Artificial intelligence was considered within a broader framework that combined cultural, sporting, and educational activities. Rather than presenting AI as a universal solution, the analysis sought to show how such tools might be integrated in practice and how they could contribute to inclusive methods of non-formal education. The intention was to generate empirically grounded insights that might guide the wider adoption of approaches sensitive to the specific needs of these settings.

Research Questions

In line with the research problem, focus, and aim, the following research questions have been formulated:

1. What educational opportunities arise from integrating cultural, sports, and educational activities within residential childcare?
2. What role can AI play in supporting inclusive and adaptive education in residential childcare settings?
3. How can these approaches be effectively implemented across different cultural and institutional contexts, particularly within the Visegrad Group countries?

Research Methodology

General Background

This study builds on a body of research concerned with the education and development of children in residential childcare. These children continue to encounter restricted access to individualised learning, limited exposure to modern technologies, and only occasional opportunities to take part in stimulating cultural or sporting activities. Previous scholarship

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has therefore attempted to identify methods that might compensate for such deficits and better prepare young people for participation in a digital and increasingly interconnected society.

The present study draws on an international project supported by the Visegrad Fund, which was used as a model case for experimenting with new approaches. The project created a structured setting where cultural, sporting, and educational components could be combined, while at the same time testing how artificial intelligence might contribute to this integration. Over a three-month period, activities were carried out within residential childcare institutions and concluded with an international meeting that provided a setting to assess both functionality and transferability in an intercultural context.

This research stands at the intersection of two lines of inquiry: the long-term study of education in residential childcare and the more focused exploration of cultural, sporting, and educational practices that may open new possibilities. Within this setting, attention is also given to the pedagogical potential of artificial intelligence. The framework adopted here not only seeks to identify educational opportunities but also to establish a methodological basis that could inform subsequent studies and professional practice.

To pursue these aims, the study moved away from quantitative measurement and employed a qualitative design. Sustained engagement with the target population made Participatory Action Research (PAR) an appropriate choice. This approach allowed children, educators, and professionals to take an active role in shaping the activities and reflecting on their outcomes, thereby embedding participation into the research process itself.

Context

The study was embedded within the international project Sport, Culture, and Education: Empowering Visegrad's Children for a Brighter Future, supported by the Visegrad Fund. The primary fieldwork was conducted in June 2025 in Zlín, Czech Republic, during a flagship event known as the Visegrad Unity Games. This initiative was designed to promote social inclusion, intercultural dialogue, and participatory educational practices for children in residential childcare.

Participants comprised a total of 68 children: 53 from Slovakia and the Czech Republic, representing several different children's homes, and 15 from a Ukrainian residential childcare institution that had been temporarily relocated to Poland as a result of the war. These children were accompanied by 21 childcare professionals, educators, and specialists, who ensured that the programme reflected both the lived experiences of the children and the professional expertise of practitioners.

Although the total sample size might appear limited, it must be emphasised that access to children in residential childcare for pedagogical research is inherently challenging. The study group, therefore, represents a rare and highly valuable research population. The participating children were both boys and girls, aged between 11 and 18 years, while the Ukrainian group constituted a unique case: they all originated from a single residential childcare institution and were exclusively boys. This composition made it possible to explore a diversity of perspectives within the Czech and Slovak groups, while also capturing the specific realities of a homogeneous group affected by forced displacement.

While the study does not claim to produce generalisable findings in the statistical sense, its value lies in the uniqueness and accessibility of the target group. Bringing together children from three distinct national systems of residential childcare within one participatory, intercultural setting created an unprecedented configuration for research. Previous research has often compared national systems in parallel, with attention directed mainly to structural or policy differences. This project, by contrast, brought children and professionals from three distinct systems into direct interaction, producing insights that could not be reached through

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comparative analysis alone. The setting offered a rare opportunity to observe how educational, cultural, and sports activities function across diverse contexts while making visible both shared patterns and dynamics specific to individual systems.

The Visegrad Unity Games

At the centre of the project were the Visegrad Unity Games, a sports initiative that extended well beyond the realm of athletics. The event was intended to cultivate teamwork, empathy, and intercultural exchange, offering a structured yet playful space where children interacted across linguistic and national boundaries. Physical activity functioned both as a source of well-being and as a symbolic medium through which trust and social cohesion could take shape. Competition was intentionally marginalised, with attention directed instead toward the shared multicultural experience. Inclusion was not treated as an abstract principle but enacted through cooperative and embodied forms of interaction.

Visegrad Skills for Inclusion: Empowering through Education

Alongside the sports programme, an educational workshop entitled Visegrad Skills for Inclusion addressed the role of education in fostering civic and social competences. Activities focused on metacognition, self-reflection, and peer exchange, encouraging children to articulate regional similarities and differences in their educational experiences. The workshop highlighted agency, motivation for learning, and the development of soft skills essential for twenty-first-century citizenship.

Cultural Mosaic of the Visegrad Nations

The second workshop, Cultural Mosaic of the Visegrad Nations, used creative approaches such as drama-in-education, storytelling, and symbolic art. These activities allowed children and staff to share experiences, co-construct narratives, and reflect on questions of identity and belonging. The workshop encouraged cultural self-awareness while at the same time promoting mutual respect and giving children's voices a place within the varied cultural landscape of the Visegrad region.

Use of Artificial Intelligence in Participatory Practice

Both workshops systematically integrated AI applications as supportive educational and analytical tools. AI was used to facilitate personalised content creation, automatic transcription of reflections, and preliminary thematic analysis. Visual design tools supported the co-creation of artistic outputs, enabling children to see their contributions reflected in tangible outcomes. Importantly, AI provided not only technical assistance but also pedagogical opportunities by enabling adaptive learning and deepening participatory reflection. Its role in expanding the scope of inclusive education will be examined in greater depth in subsequent sections, with particular attention to ethical considerations and pedagogical added value.

Instrument and Procedures

The methodological framework of this study was shaped by the need to capture the lived educational opportunities of children in residential childcare. For this purpose, Participatory Action Research (PAR) was adopted as the core approach. PAR was selected because it does not treat children as passive research subjects but as active partners whose voices are

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essential for understanding and transforming their environment. In residential childcare, where children's perspectives are often marginalised, PAR provides both an ethical and practical means of generating knowledge that is immediately relevant to practice (Cornish et al., 2023; Shamrova & Cummings, 2017). It links the process of inquiry with purposeful action, enabling empowerment, competence-building, and the creation of solutions responsive to children's genuine needs (Flicker, 2008; McIntyre, 2008).

Within this framework, qualitative methods were employed in ways that complemented one another. Semi-structured interviews gave children and professionals the chance to describe their experiences in their own words, while systematic observation of educational, sporting, and cultural activities offered contextual insight into patterns of interaction and the enactment of inclusive practices (Boyko, 2013; Dunwoodie et al., 2023; Espedal, 2022; Sirris et al., 2022). A focused case study, centred on a group of Ukrainian children evacuated to Poland, further illustrated how displacement and cultural background shaped both adaptation and participation in inclusive activities (Carter, 2024; Hamilton & Corbett-Whittier, 2013; Takahashi & Araujo, 2019).

These strands of evidence informed the PAR cycle in different yet interconnected ways. Observations grounded the findings in lived practice; interviews provided access to subjective perspectives; and the case study illuminated structural and contextual influences. Their integration, refined through collaborative analysis with participants and expert partners, appears to have ensured that the study generated results of both theoretical significance and practical value for inclusive education (Arnadottir et al., 2025; Cockerham, 2024).

Data Analysis

The data analysis combined elements of Interpretative Phenomenological Analysis (IPA) and Grounded Theory (GT). Together, these approaches allowed for close attention to individual accounts while also supporting the systematic development of theory from the data itself. IPA centres on how participants perceive and interpret their experiences, with emphasis on depth of meaning and the subjective lens through which life events are understood (Biggerstaff & Thompson, 2008; Rajasinghe, 2020). In the context of residential childcare, this focus is particularly pertinent, as children's trajectories are often shaped by unique constellations of lived experiences and by the strategies they adopt to navigate challenging circumstances (Alase, 2017; Van Manen, 2018).

GT complemented this interpretative lens by tracing emergent patterns and categories across the material and situating them within a broader conceptual framework (Makri & Neely, 2021). Through open, axial, and selective coding, categories were gradually refined and aligned with empirical evidence (Charmaz & Thornberg, 2021). The interplay of IPA and GT thus made it possible to preserve the specificity of individual voices while at the same time generating insights with wider theoretical resonance for understanding educational processes in residential childcare.

Given the cross-cultural nature of the project, the analysis was conducted comparatively to identify both similarities and differences among groups from different countries. At the same time, the individual perspective of each child was carefully respected, as experiences could vary significantly even within the same group, depending on personal history, prior educational opportunities, and current psychosocial circumstances.

Particular attention was devoted to the interpretation of data from the Ukrainian group. Their experience of forced displacement and life in exile presented specific challenges and opportunities for the educational process. Their reflections offered valuable insights into the role of cultural identity.

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Findings were regularly discussed within the research team and triangulated with the perspectives of educators and professionals from participating institutions throughout the analytical process. This participatory validation helped minimise the risk of interpretive bias and ensured that the resulting themes accurately reflected the lived realities of the participants.

Summary of Methodological Approach

The methodological framework of this study draws on long-standing research into residential childcare and is complemented by a focused international initiative. By integrating cultural, educational, and sporting interventions with the exploratory use of artificial intelligence, the study seeks to advance the ongoing debate on inclusive education for children with experience of residential care.

What makes this project exceptionally distinctive is the simultaneous inclusion of three groups of children, each shaped by different national residential childcare systems: children from the Czech Republic, Slovakia, and Ukraine (temporarily living in Poland due to the war). Whereas most previous research has been limited to comparing national systems in parallel, this study introduced a rare and methodologically significant setting in which children and professionals from three diverse systems interacted directly. This approach enabled the identification of both cross-national commonalities and system-specific patterns that remain invisible in single-country or purely comparative studies.

The integration of these perspectives within a participatory action research framework provided a distinctive vantage point. It allowed not only the description of innovative educational practices but also their evaluation in terms of applicability and transferability across different cultural and institutional contexts. This design positions the study as a pioneering contribution to international research on residential childcare and inclusive pedagogy, offering insights that extend beyond the Visegrad region.

Ethics

The research was carried out in accordance with international standards for work with children and young people in sensitive social contexts and was guided by the ethical principles of Participatory Action Research (Correia, 2023; Kiernan & McMahon, 2024). It also drew on the concept of value-sensitive design, which places emphasis on explicit ethical commitments in the development of methods and tools, particularly when technological elements are involved (Jacobs & Huldtgren, 2021). Before implementation, all participating institutions and individuals received clear information about the project's objectives, planned procedures, and anticipated outcomes. Informed consent was obtained from both the children and their legal guardians, using communication formats tailored to the children's age, cognitive abilities, and level of comprehension.

Particular emphasis is placed on protecting participants' identity and privacy. All data are anonymised, and photographs or audiovisual recordings are made only with prior informed consent. No such materials are disclosed without explicit authorisation. Identifiable information is stored separately from research data and is accessible only to a strictly limited group of authorised individuals.

Specific ethical risks are carefully addressed when artificial intelligence tools are employed. The most evident risk areas were especially those related to personal data protection, cultural sensitivity, and the relevance of generated content. All AI-generated outputs are subject to human review prior to use or dissemination to participants, in order to prevent the distribution of inaccurate, inappropriate, or culturally insensitive material.

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The project consistently applied the principle of minimising the burden on children. Participation in both activities and research was voluntary, and participants could withdraw at any time without negative consequences. A safe and supportive environment was created to encourage open engagement without fear of judgement or stigmatisation. Observing these principles was not only an ethical requirement but also essential for the credibility of the findings. A strong ethical foundation fostered trust among participants and supported lasting collaboration between the researcher and the institutions involved.

Research Results

The findings of this study demonstrate that cultural, sporting, and educational activities within residential childcare function not merely as leisure opportunities but as catalysts for social inclusion, competence development, and intercultural learning. Despite the relatively small sample, the dataset is of exceptional value because it provides unique access to three distinct national systems of residential childcare and includes the specific circumstances of Ukrainian children displaced by war. Such a constellation of participants has not previously been examined within a single research design, which underscores the originality and relevance of the study.

The analysis of collected data revealed several consistent patterns. First, children described cultural and sports activities as spaces where they felt equal and recognised, a striking contrast to the marginalisation they often reported in formal schooling. Observations supported these accounts, showing strong participation across age and gender, as well as spontaneous expressions of peer support. Semi-structured interviews with professional staff added another perspective, emphasising the value of the participatory project design. Staff noted that it enhanced children's self-confidence and encouraged more open and trusting communication between caregivers and young people. Third, the focused case study of the Ukrainian group illuminated the additional challenges faced by displaced children, particularly language barriers and gender imbalance. At the same time, it showed that structured, inclusive activities enabled these children to integrate with peers from other countries more quickly than anticipated.

These results emphasise that participatory and culturally grounded approaches are not supplementary but central to inclusive education in residential childcare. The methodology, far from being an abstract research framework, actively facilitated conditions in which marginalised children could experience recognition and a stronger sense of agency.

Holistic Learning Environment

The findings suggest that the integration of educational, sporting, and cultural activities fostered an environment in which children felt secure, motivated, and recognised. This pattern was evident across all three national groups, although the aspects they valued differed. Czech participants stressed how sport helped them prepare for learning tasks. Slovak participants drew attention to collaboration and the friendships formed in group settings. Ukrainian participants described cultural activities as a safe space for self-expression and for articulating their personal identity. In the lists that follow, children are abbreviated as Ch and staff as St. Four dominant codes were identified and are presented in List 1, which illustrates how the holistic learning environment was shaped through the interplay of sport, culture, and education.

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List 1
Partial Findings from the Area of Holistic Learning Environment

Significant Codes; Brief Description of the Code; Selected Statements
Code 1: *Sports as Equalisers* Sports activities provided an environment where children felt equal and included.
Ch, CZ: "When we played games and then did the lesson, it was easier to focus, and I wanted to try." *Ch, UA*: "Sports made us friends, even if we didn't speak the same language." *Ch, SK*: "Running together felt like we were the same, nobody was better or worse." *Ch, UA*: "In football, we didn't need words, we just understood." *St, CZ*: "Sports made it easier to reach those who avoid school tasks." *St, SK*: "Physical games helped to balance differences between children very quickly."
Code 2: *Emotional Safety in Cultural Activities* Cultural and artistic activities created a safe space for self-expression and the sharing of emotions.
Ch, UA: "When I painted, I showed them how we do it at home, and they liked it." *Ch, CZ*: "In art, I could show feelings without talking." *Ch, UA*: "The pictures I drew made me feel safe, like I was back home." Ch, SK: "When we sang together, I felt calm and brave to try more." *St, UA*: "At first, they were cautious, but art gave them a safe way to share feelings." *St, CZ:* "Children who are usually shy spoke more when the activity was playful."
Code 3: *Learning Through Playful Engagement.* Playful engagement supported spontaneous learning and cooperation.
Ch, CZ: "It was fun to learn their songs, they were different but nice." *Ch, SK*: "I liked when we worked in pairs, because then we were stronger together." *Ch, CZ*: "I learned new words when we played with cards, it was not boring like in school." *Ch, SK*: "Games made me want to try even the hard parts, because we laughed together." *St, SK*: "They trusted each other more quickly when working in teams." *St, CZ*: "Play created an open atmosphere, which is rare in formal learning."
Code 4: *Competence Development Across Domains* Activities simultaneously supported linguistic, social, and cognitive skills.
Ch, SK: "I helped them with words, and then we played card games together." *Ch, CZ:* "I learned to explain in English, even if just a little." *Ch, UA:* "I discovered I can draw and also tell my story in another language." *Ch, CZ:* "When we solved tasks after sport, it felt easier to think and talk." *St, CZ:* "They gained courage to speak up during the music session." *St, UA:* "They connected with peers quickly through games, even without full language understanding."

Note. Ch = child; St = staff (educators, professionals); CZ = Czech Republic; S = Slovakia; UA = Ukraine

The inclusion of educational, cultural, and sporting activities appeared to foster environments in which children felt a sense of equality, safety, and motivation. For the Czech participants, sporting activities were frequently described as energising and as helping them prepare for subsequent learning tasks. Slovak children, by contrast, placed greater emphasis on collaboration and the feeling of belonging within peer groups. Ukrainian participants often turned to cultural activities as a means of expressing identity and establishing a sense of security in unfamiliar surroundings. Observational data further suggested that playful forms of engagement enhanced children's ability to concentrate, while the interplay of different domains contributed to the development of linguistic, cognitive, and social competences.

Cross-National and Multicultural Inclusion

The multicultural setting brought to light different forms of engagement among the participating groups. Czech children showed curiosity toward unfamiliar practices and a

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willingness to engage in cultural exchange. Slovak participants frequently assumed the role of mediators, drawing on their linguistic and cultural closeness to help bridge communication gaps between peers. Ukrainian children, though initially limited by language barriers, gradually became more involved through participation in sport, music, and artistic expression. Despite these differences, a shared sense of belonging began to emerge, indicating that collective experiences can at times outweigh linguistic and cultural divides. The most relevant codes are summarised in List 2, together with descriptions and illustrative statements that reflect the processes of cross-national and multicultural inclusion.

List 2

Partial Findings from the Area of Cross-National and Multicultural Inclusion

Significant Codes; Brief Description of the Code; Selected Statements
Code 1: *Shared Belonging Through Music and Games* Music and games facilitated a sense of shared belonging that transcended language barriers.
Ch, SK: "Language barriers disappeared when music started." *Ch, UA*: "We clapped together, and suddenly we understood each other." *Ch, CZ*: "Singing made everyone equal." *Ch, UA*: "When we danced, I felt like we were one group." *St, CZ*: "Shared rhythm and music unified them more than any structured task." *St, SK*: "Games created a sense of belonging that words alone could not achieve."
Code 2: *Slovak Children as Cultural Mediators* Slovak children acted as bridges between the Czech and Ukrainian groups, frequently translating and facilitating instructions.
Ch, SK: "I helped them with words, and then we played together." *Ch, CZ*: "Slovak guy explained us the game, we listened to him." *Ch, SK*: "I liked being the one who could say things to both sides." *Ch, UA*: "It felt good that they could translate and help everyone play together." *St, SK*: "They naturally acted as bridges; translation became part of play." *St, CZ*: "The Slovak group often made the Ukrainian children feel less excluded."
Code 3: *Ukrainian Children Overcoming Barriers* Ukrainian children overcame language and cultural obstacles through embodied forms of participation in sports, music, and art.
Ch, UA: "Sports made us friends, even if we didn't speak the same language." *Ch, UA*: "When I painted, I showed them how we do it at home." *Ch, UA*: "At first I was shy, but when we clapped together, it was easier." *Ch, UA*: "I liked when they tried my words and I tried theirs." *St, UA*: "Art gave them a safe way to share feelings." *St, SK*: "Sports activities helped the Ukrainian group overcome their initial hesitation."
Code 4: *Czech Children as Explorers of Novelty* Czech children demonstrated openness to new cultural stimuli and readiness to learn from others.
Ch, CZ: "It was fun to learn their songs, they were different but nice." *Ch, UA*: "They liked when they had to copy our game, it was easy for them." *Ch, CZ*: "Trying food from them was strange, but I liked it." *Ch, CZ*: "Their games were not like ours, so it was exciting." *St, CZ*: "They adapted quickly and showed real curiosity about new cultural elements." *St, SK*: "Czech children were often the first to try unfamiliar activities."

Multicultural activities revealed different patterns of engagement within each national group. Czech children adapted quickly and showed curiosity toward unfamiliar cultural elements. Slovak participants often acted as mediators, helping peers by translating or clarifying meanings. Ukrainian children, facing the greatest linguistic barriers, relied on sport, music and art, using rhythm, gesture and performance as ways of entering the group. Shared experiences in music and games nurtured a sense of belonging that transcended language and cultural divides and highlighted the inclusive potential of participatory activities.

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AI-Enhanced Participatory Learning

The use of artificial intelligence (AI) in the project emerged as an important element supporting inclusive education in residential childcare. AI helped to overcome language barriers, enabled personalised learning, provided immediate feedback, and offered culturally sensitive stimuli. For children, this meant not only greater engagement but also the perception that technology could facilitate both learning and communication. List 3 presents significant codes with descriptions and illustrative statements that capture the role of AI in enhancing participatory learning.

List 3
Partial Findings from the Area of AI-Enhanced Participatory Learning

Significant Codes; Brief Description of the Code; Selected Statements
Code 1: *AI as Language Bridge* AI technologies facilitated translation and reduced tension arising from linguistic differences.
Ch, UA: "The tablet showed the same word in Czech and Ukrainian, and then we knew." *Ch, SK*: "I liked when it translated my word, so they understood me." *Ch, CZ*: "It was easier to play when the computer said what it means." *Ch, UA*: "I felt better when they could read my words too." *St, SK*: "It helped me explain quickly without stopping the activity." *St, CZ*: "AI reduced misunderstandings and kept the children engaged."
Code 2: *Personalised Learning Support* AI allowed the adaptation of tasks to individual abilities and learning pace.
Ch, CZ: "I liked when the computer made an easier task just for me." *Ch, SK*: "The quiz changed for me when it was too hard." *Ch, UA*: "I liked that I could do it slowly, and it was still okay." *Ch, CZ*: "It gave me another try, so I did not feel bad." *St, CZ*: "The quiz adapted to their pace; slower children were not left behind." *St, SK*: "Children gained confidence because tasks felt achievable."
Code 3: *Immediate Feedback and Motivation* Instant feedback increased motivation to continue and encouraged children to try new tasks.
Ch, SK: "It told me 'good job' right away, so I wanted to try again." *Ch, CZ*: "I was happy when it showed the green light fast." *Ch, UA*: "I liked when it clapped on the screen, it felt like winning." *Ch, CZ*: "I tried again because it said I was close to good." *St, CZ*: "Children reacted with excitement when they saw results instantly." *St, SK*: "Immediate feedback made them persist longer in tasks."
Code 4: *Culturally Sensitive Mediation* AI reflected cultural identity and supported children's motivation.
Ch, UA: "The pictures showed something from our country, it felt nice." *Ch, CZ*: "It was cool when the presentation was full of interesting things, it felt like a game." *Ch, SK*: "We worked together on the tablet, and everyone had an idea, it was fun." *Ch, UA*: "With the translator, I could tell them what I wanted, and then we laughed together." *Ch, CZ*: "It was cool that it showed Slovak words too." *Ch, SK*: "When it played a song from here, we all knew it." *Ch, UA*: "Including Ukrainian symbols in tasks motivated me strongly." *St, UA*: "Including Ukrainian symbols in tasks motivated them strongly." *St, SK*: "Cultural adaptation kept the activities relevant and engaging."

The exploratory use of artificial intelligence functioned as a supportive tool in residential childcare. AI acted as a bridge for overcoming language barriers, personalised tasks to individual abilities, and provided immediate feedback that increased motivation. It also integrated culturally sensitive features that validated children's identities. While Czech children appreciated the playful and interactive dimension, Slovak children viewed AI as a collaborative tool, and Ukrainian children relied on it to communicate and participate on equal terms. Observations confirmed that technology contributed to inclusion when embedded within participatory and human-centred frameworks.

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Synthesis of Findings

The analysis indicates that the integration of educational, sporting, and cultural activities in residential childcare produces outcomes that extend beyond momentary engagement. Such activities seem to create spaces where children experience recognition, develop a sense of agency, and strengthen intercultural competencies. At the same time, they encourage professionals to reflect on their own practice and adapt inclusive strategies within the particular national contexts in which they work. The contrasts between Czech, Slovak, and Ukrainian participants point to the influence of cultural traditions and socio-political conditions on how children engage with and benefit from such opportunities. Even so, certain elements recurred across all groups: children consistently reported peer support, shared involvement, and the beginnings of solidarity that may carry significance for their future social integration.

By combining children's accounts with the perspectives of professionals and systematic observation, this study offers insights into how residential childcare might be rethought. These institutions need not remain solely protective spaces; they can be shaped into environments that foster learning, nurture inclusion, and cultivate competences essential for participation in contemporary society. The findings form a basis for the discussion that follows, where the implications, possible limitations, and potential transferability of this model are examined within wider pedagogical and international contexts.

Discussion

The findings indicate that integrated programmes that combine sport, culture, and education in residential childcare function as core mechanisms for inclusion rather than optional enrichment. Evidence from youth development and arts-based pedagogy supports the claim that structured non-formal activities can enhance motivation, social bonding, and competence development (Hunter & Frawley, 2023). Sports and games are consistently associated with positive youth development when they prioritise teamwork, prosocial goals, and supportive climates, which aligns with the high participation and spontaneous peer support observed across groups (Fraser-Thomas et al., 2005). Arts-based sessions provide parallel benefits for emotional expression and identity work, particularly for children who are wary of formal schooling. These patterns accord with prior syntheses of sport-based youth development and arts-based resilience building (Salmon, 2023).

Group processes were central to these effects. A constructive group climate is known to reduce aggression and improve engagement in residential childcare settings (Claiborne et al., 2011; Tyrer & Fazel, 2014), which helps to explain why mixed-nationality teams and paired tasks produced rapid trust building and collaborative behaviour during the programme. The observed peer mediation and shared rule-making reflect conditions associated with safer, more participatory group climates in residential childcare (Hoffnung-Assouline et al., 2025).

Cross-national differences shaped how children entered and benefited from activities, yet the overall direction was convergent. Variation in national systems of residential childcare is well documented and carries consequences for practice, participation, and outcomes (Daněk et al., 2023). In that context, the present configuration of Czech, Slovak, and Ukrainian groups illustrates how common design principles can travel across systems while still being adapted to local expectations. The rapid social integration of the displaced Ukrainian group is consistent with evidence that structured group activities, including arts and sport, can mitigate barriers to belonging among refugee and asylum-seeking children (Sondermann et al., 2021; Van Der Helm et al., 2018).

Participation was not simply a design value but an operational mechanism. When children help set goals, translate instructions, and scaffold one another's engagement, decision-

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making becomes distributed and agency is strengthened. This mirrors established participation frameworks that emphasise openings, opportunities, and obligations for shared decision-making in child-centred practice. The alignment between children's reported sense of equality in activities and the staff testimonies of improved communication fits this participatory logic (Bessell, 2011; Shier, 2021).

Artificial intelligence operated as a supporting layer that lowered participation barriers without substituting professional judgement. The tools used to simplify language, translate key terms, differentiate task difficulty, and summarise feedback correspond to documented strengths of AI for personalising learning and supporting heterogeneous groups. At the same time, work on the ethics of AI in education underlines that technological affordances must remain subordinate to human values, including privacy, transparency, and the primacy of relationships in vulnerable settings (Holmes et al., 2022). The present pattern aligns with that position (Levrouw et al., 2018; Wang et al., 2024).

Two key implications emerge from the study. One concerns the design of inclusive programmes in residential childcare: they are most effective when conceived as holistic learning environments in which sport and culture are embedded within educational aims rather than treated as parallel add-ons (Coholic et al., 2012; Fraser-Thomas et al., 2005). Achieving this requires careful attention to the climate of the group, the roles assumed by peers, and the participatory structures that support meaningful involvement, all of which appear to contribute to safer and more engaging settings. The second implication relates to the use of artificial intelligence. AI can strengthen accessibility and responsiveness in situations where language barriers, literacy challenges, or cognitive processing demands might otherwise hinder participation (Zawacki-Richter et al., 2019). Its integration, however, should be guided by established ethical standards and kept firmly under professional oversight.

In this project, the use of artificial intelligence was exploratory and limited in scope. Further research is required to establish the practical and ethical conditions under which AI can contribute meaningfully to education (Yan et al., 2024). Within residential childcare, this represents a new and largely unexplored domain (Guérin et al., 2025). The findings must therefore be regarded as preliminary indications that highlight potential directions for systematic inquiry rather than conclusive results.

Limitations

Several limitations should be recognised to place the findings in context. The project lasted only three months and involved a small number of institutions. Although the sample covered Czech, Slovak, and Ukrainian settings, it cannot capture the full variability of residential childcare in the Visegrad region.

The Ukrainian group, evacuated to Poland because of the war, presented circumstances that were exceptional. Their adaptation and educational needs were shaped by displacement and insecurity, which makes their experience difficult to compare with the other participants.

The use of Participatory Action Research brought advantages in terms of authenticity and engagement, yet it also raised the possibility of interpretive bias linked to the researcher's dual role. Measures such as triangulation and validation with participants helped to reduce this risk, though it cannot be ruled out entirely.

Artificial intelligence was tested only on a pilot scale and adapted to the specific groups involved. Its use was exploratory and small-scale, and any conclusions about its potential should therefore be regarded as preliminary, pointing to areas for further exploration rather than conclusive results.

The research also unfolded in a shifting environment marked by staff changes, legislative reforms, and resource constraints. These external factors may have influenced both the delivery and the sustainability of the activities introduced.

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These limits suggest that while the study offers important insights into the possibilities of participatory and holistic education in residential childcare, they should be read cautiously. Future research would profit from longer timeframes, broader samples, and systematic international comparisons, alongside controlled testing of AI-based interventions with close attention to ethics and cultural appropriateness.

Conclusions and Implications

This study demonstrates that participatory and culturally grounded activities in residential childcare, including sports, cultural programmes and educational initiatives, can function as powerful instruments of inclusion and competence building while also supporting intercultural learning. Children described these environments as spaces where they felt recognised and treated as equals, and observations indicated strong engagement and mutual support across groups.

The cross-national design, involving Czech, Slovak, and Ukrainian children, including those displaced by war, adds to the study's originality. Their experiences point to the importance of relational dynamics such as peer mediation and embodied forms of communication, which appear crucial for overcoming barriers and enabling participation.

The work further reveals the potential of artificial intelligence to enhance adaptability and accessibility in settings marked by linguistic and cultural diversity. At the same time, the findings caution against viewing technology as sufficient in itself: inclusion ultimately rests on trust, care, and human relationships

Taken together, the results suggest that education in residential childcare can acquire a transformative quality when approached as a holistic and participatory process. In such circumstances, marginalised children do not merely gain knowledge; they also begin to experience belonging, exercise agency, and receive recognition. Future research could extend these insights through longer-term and comparative designs, testing whether inclusive and AI-supported approaches can become lasting features of residential childcare. The significance of this work reaches beyond the local setting, offering perspectives that may be relevant in other countries seeking to integrate children from diverse cultural and linguistic backgrounds.

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ENHANCING PRIMARY STUDENTS' READING SKILLS THROUGH AUGMENTED REALITY-ENRICHED TURKISH TEXTS

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Abstract

The present study examined whether the integration of augmented reality (AR) into fourth-grade Turkish reading lessons enhances students' reading comprehension and motivation. A quasi-experimental pretest-posttest control group design was employed, involving 48 students (24 experimental and 24 control) from a public primary school. Students in the experimental group engaged with AR-enriched texts, while the control group read the same texts without AR enhancement. Reading comprehension proficiency and attitudes toward AR were measured using standardized scales, and qualitative interviews were conducted to gather student feedback. Results indicated that the experimental group demonstrated a significant improvement in reading skill scores compared to their baseline, while the control group showed no significant progress. A moderate positive correlation was observed between students' reading comprehension self-efficacy and their attitudes towards AR, indicating that students who felt more confident in their reading skills also tended to view AR-based learning more positively. Qualitative findings further revealed that AR enriched texts increased student engagement—evoking curiosity, excitement, and enjoyment—and helped students maintain focus during reading. These results suggest that integrating AR into reading activities can enhance elementary students' reading abilities and motivation. These findings highlight the potential of integrating AR into literacy education to foster students' engagement and comprehension. The study underscores the importance of designing technology-supported reading activities that align with curriculum goals and suggests that AR can serve as an effective educational tool to enhance motivation and learning outcomes in primary education.
Keywords: *augmented reality, reading skills, primary education, educational technology*

Introduction

Technological transformation in education has fundamentally altered pedagogical approaches and learning experiences worldwide. At the forefront of this transformation, Augmented Reality (AR) technology presents significant opportunities for enhancing educational outcomes by overlaying digital elements onto real-world environments. AR provides interactive and visually enriched learning experiences that can help students conceptualize abstract ideas and complex concepts (Azuma, 2004; Billinghurst & Duenser, 2012).

Research demonstrates that AR integration in classroom settings can facilitate students' comprehension of challenging content by creating more immersive and engaging learning environments (Kaufmann & Schmalstieg, 2002; Kerawalla et al., 2006). The implementation of AR technology in educational contexts yields multifaceted benefits, including increased student motivation and the establishment of high-quality learning environments that promote learner-centered, experiential education (Bower et al., 2014; Dunston et al., 2002).

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However, AR integration presents certain challenges that warrant careful consideration. Limited device accessibility can exacerbate educational inequities, while excessive reliance on technology may adversely affect learners' real-world skill development and social interactions if not properly monitored (Labhane et al., 2024). Consequently, effective AR implementation in educational contexts requires a balanced approach that maximizes technological advantages while mitigating potential risks.

Recent empirical research in educational technology has highlighted the promising role of augmented reality in literacy education. Conventional approaches to reading pedagogy have increasingly incorporated multimedia elements to enhance engagement, with AR representing a significant advancement in integrating digital content with textual materials. Multiple studies have examined AR's effect on reading comprehension, yielding predominantly positive outcomes.

Çetinkaya Özdemir and Akyol (2021) conducted a quasi-experimental study with 54 primary school students, demonstrating that participants using AR-enhanced reading materials significantly outperformed the control group in reading comprehension assessments. Their findings underscore AR's capacity to support textual understanding by providing contextual cues and interactive elements directly embedded within reading materials. Similarly, Batdı and Talan (2019) reported that primary school students using AR applications during reading showed significant improvements in both comprehension and summarization skills compared to peers working with conventional textbooks, highlighting AR's effectiveness in fostering higher-order literacy abilities. Within the Turkish educational context, research by Zeybek and Sayın (2022) has provided particularly relevant insights. Their study on AR-based reading practices in primary school settings revealed notable improvements in terms of students' reading comprehension and motivation. The AR intervention transformed reading sessions into more interactive and gamified experiences, significantly increasing student enthusiasm for literacy tasks. These findings align with international research and provide evidence for AR's cross-linguistic effectiveness.

Meta-analytic studies have consolidated evidence supporting AR's educational benefits. Şimşek and Direkçi (2023) conducted a systematic review and meta-analysis examining AR's effects on reading practices, concluding that AR technologies have a significant positive impact on students' reading comprehension and reading speed. They attributed these improvements to AR's capacity to present information through multiple modalities (textual, auditory, and visual), facilitating more effective information processing and retention.

Garzón et al. (2019) have conducted a comprehensive meta-analysis on AR applications in education, identifying consistent improvements in learning outcomes, with reading comprehension showing particularly substantial benefits when AR was used as a supplementary educational tool. The authors attribute these gains to enhanced student engagement and the interactive feedback mechanisms inherent in AR applications.

Motivational factors represent critical components in reading development, and AR demonstrates considerable influence on these affective domains. Alsowat (2017) examined the effect of AR on English as a Foreign Language (EFL) reading and found that participants in the AR group not only achieved higher comprehension scores but also reported significantly greater interest and motivation compared to their non-AR counterparts. The interactive elements of AR, including animations and responsive feedback, can transform reading from a passive activity into an active exploration process, thereby enhancing student motivation.

While literature predominantly supports AR implementation, it also provides important considerations for effective integration. The pedagogical design of AR content proves crucial; merely adding digital elements to texts does not guarantee improved learning outcomes. Content must be pedagogically meaningful and aligned with specific learning objectives. Bursali and Yilmaz (2019) argued that AR features should complement and reinforce reading strategies

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rather than distract from textual content. Their research indicates that when AR features directly relate to text (such as vocabulary support or story element visualization), reading comprehension improves, while extraneous or overly complex AR features may cause cognitive overload.

Current research provides compelling evidence that AR can enhance reading comprehension, engagement, and motivation among primary and secondary students. AR's ability to create multimodal learning environments appears particularly beneficial for learners who struggle with traditional text-only materials. These findings establish a solid foundation for future research exploring AR's potential in literacy education across diverse linguistic and cultural contexts, while emphasizing the importance of thoughtful pedagogical integration to maximize educational benefits.

Research Problem

Conventional approaches to developing reading skills, particularly in primary education, may not fully engage today's digitally oriented learners. Challenges such as declining motivation to read and difficulties in comprehending text can potentially be addressed through innovative educational strategies. Augmented Reality (AR) offers a novel way to enrich reading materials with interactive features, which may help capture students' attention and enhance comprehension. The research problem focuses on whether integrating AR into reading materials can meaningfully improve primary school students' reading skills and overall learning experience.

Research Focus

This study focuses on the intersection of technology and literacy education. Specifically, it examines augmented reality as an educational tool in primary-level Turkish language classes, exploring its effects on students' reading comprehension skills and learning motivation. The content area of focus is Turkish reading texts for fourth-grade students, enriched with AR elements such as 3D visuals and audio to create an interactive reading environment.

Research Aim and Research Questions

The main purpose of the research was to evaluate the effect of AR-enriched texts on improving primary school students' reading skills. In line with this aim, the study addressed the following research questions:

1) Does the use of AR-enriched texts in Turkish language lessons lead to significant improvements in fourth-grade students' reading comprehension compared to standard printed (non-AR) texts?

2) What is the correlation between students' reading comprehension proficiency and their attitudes towards the use of AR technology in learning?

3) How do students experience reading AR-enriched texts with respect to their engagement, motivation, and the challenges they encounter during the process?

By addressing these questions, the study aimed to demonstrate the potential of AR to enhance literacy education and to offer practical guidance for educators considering the integration of AR technologies into their teaching practices.

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Research Methodology

Design

This research employed a mixed-methods, quasi-experimental design to investigate the effects of AR-enriched texts on students' reading skills. The quantitative component followed a pretest–posttest control group design, while the qualitative component involved interviews to capture student perceptions. A quasi-experimental approach was chosen due to the classroom setting, where random assignment of students to separate groups was not feasible; instead, existing class sections were designated as experimental and control groups. While intact classes were used, pre-existing differences (e.g., student motivation, teacher–student dynamics) may still have influenced the outcomes. To address this, pretests were administered, and the analyses showed no significant baseline differences between groups, supporting the internal validity of the comparisons. The study was conducted in the natural setting of a single primary school to preserve ecological validity, which also represents a limitation in terms of generalizing the findings. Both quantitative and qualitative data were collected in parallel, allowing for triangulation of findings to better understand the effect of the AR intervention. This methodology aimed to isolate the effect of the AR-enriched texts by comparing outcomes between students who used the AR materials and those who engaged with conventional reading activities using identical texts without the AR features. Ethical considerations, including informed consent from parents and assent from the students, were observed, and the school administration approved the implementation of the AR activities as part of the research, which was conducted between April 3 and May 21, 2023.

Study Group

The study group consisted of 48 fourth-grade students (approximately 9–10 years old) from a public primary school located in the Alaplı district of Zonguldak province in northwestern Turkey. These students were divided into two groups: an experimental group (n = 24) and a control group (n = 24). The grouping was done by class: one intact fourth-grade class was assigned as the experimental group, and another as the control, ensuring that normal classroom dynamics were maintained. Both groups were equivalent in terms of age, grade level, and prior academic performance based on school records and a preliminary reading skill assessment conducted with the Reading Comprehension Proficiency Scale, a curriculum-based test aligned with fourth-grade standards. A pretest confirmed that there were no statistically significant differences between the groups' baseline reading comprehension levels (t = 1.266, p = .212). The school was located in an urban area and was equipped with a computer lab and tablet devices, which facilitated the deployment of the AR application for the experimental group. All participating students had a basic familiarity with touchscreen devices (such as tablets or smartphones), but none had prior experience with educational AR applications. This ensured that any improvements observed could be attributed to the AR intervention rather than pre-existing differences in technology use. The relatively small sample size was a consequence of working with intact classrooms; however, it was considered sufficient to detect medium-to-large effects based on Cohen's (1988) guidelines for educational research and the controlled nature of the design. The study acknowledges that the sample, although representative of the school's student population, may not fully capture the diversity of socio-economic or regional backgrounds, which is considered when generalizing the results.

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Data Collection Tools and Procedures

Three main instruments were used to collect data. First, a Reading Comprehension Proficiency Scale was administered to assess students' reading skills. This scale was a curriculum-based test tailored to fourth-grade reading competencies, measuring skills such as understanding main ideas, making inferences, and summarizing. It was developed and validated in prior research to align with the Turkish language curriculum's standards for reading proficiency. The internal reliability of this scale in the present study was high (Cronbach's α = .835 for the pretest and .909 for the posttest), indicating consistent performance. Second, students' attitudes toward AR were measured by the Augmented Reality Applications Attitude Scale developed by Küçük et al. (2014). This Likert-type scale includes items that gauge students' interest, perceived usefulness, and comfort with AR technology in learning contexts. It was administered only to the experimental group (who had exposure to AR) at the end of the intervention. In our sample, the attitude scale demonstrated good reliability (α = .83), which is considered acceptable for educational research (Nunnally & Bernstein, 1994). Third, a Semi-Structured Interview Form was designed to collect qualitative data on student experiences. This form was developed in consultation with three educational technology experts and included four open-ended questions focusing on the students' feelings about reading with AR, the perceived advantages or difficulties, and suggestions for improvement. The number of questions was intentionally limited to four to accommodate the age group and ensure that primary school students could respond without experiencing fatigue or loss of attention. The interview protocol covered key topics, such as engagement levels, motivation, perceived learning, and any technical challenges encountered during the AR sessions.

The experimental treatment was built around a set of augmented reality–enriched texts. Four texts were carefully selected from the official fourth-grade Turkish language textbook used in the national curriculum, representing a range of genres: two informational texts, one narrative story, and one poem. These texts were chosen with input from subject matter experts to ensure they were age-appropriate and representative of the curriculum's reading material. Each selected text was augmented using AR technology. The development of AR content was accomplished with *Unity* 3D game engine and the *Vuforia* AR platform. For each text, relevant 3D objects, animations, or audio were created or sourced (e.g., a 3D model of a character or object mentioned in the text, or an audio narration for a poem) to complement the content of the reading passage. These AR elements were carefully aligned with the educational objectives of the text – for instance, an informational text about the solar system included AR planets that students could tap for additional facts, while the narrative story featured an AR character animation to help visualize the plot. The design of AR materials followed multimedia learning principles to avoid cognitive overload; thus, each AR element was directly related to key content in the text and was intended to reinforce comprehension rather than distract. The AR content was reviewed by three experts (a Turkish language educator, an educational technologist, and a literacy curriculum specialist) who provided feedback on its pedagogical appropriateness. Their feedback led to minor revisions to ensure that the AR elements were supportive of learning (e.g., adjusting the placement of AR triggers on the page, clarifying the guidance provided to students). During the intervention, the experimental group used tablets to interact with the AR-enriched texts. A custom AR mobile application was developed and installed on the tablets; when students pointed the tablet's camera at the textbook page, the app recognized images (via Vuforia image tracking) and displayed the corresponding AR content on-screen. Each student in the experimental group had access to a tablet during reading lessons. The teacher provided a brief demonstration to the experimental group on how to use the AR app at the start of the intervention, ensuring that students understood how to trigger and interact with the AR features (e.g., hovering over images, tapping on 3D models for information). The control group,

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in contrast, worked with the same four texts in their standard printed form, without digital enhancements. They engaged in standard classroom reading practices: reading the texts on paper and participating in teacher-led discussions and comprehension exercises.

The study was carried out over a four-week period between April 3 and May 21, 2023, during regularly scheduled Turkish language lessons. In Week 1, all students took the reading comprehension pretest. Following the pretest, the experimental group was introduced to the AR reading app and given time to familiarize themselves with one sample AR exercise unrelated to the study texts, to practice the mechanics of using the AR features. From Weeks 1 to 3, the intervention was implemented: each week, both groups read one of the selected texts during class. The experimental group read the AR-enriched version of the text – typically, they would read a segment of the text in their textbook and then use the tablet to view AR content connected to that segment. For example, while reading a story, they could see an AR illustration of the scene or hear character dialogue via the app. The teacher in the experimental class integrated prompts to guide students' attention between the text and AR features (for instance, "After reading this paragraph, use the tablet to explore the 3D model of the character and describe what you see"). Meanwhile, the control group read the same text without any AR, following the usual pedagogical routine (such as silent reading followed by teacher questions and class discussion). Both groups spent roughly equal time on each text (about two class periods per text). The teacher was careful to cover the same content and ask similar comprehension questions in both classes to ensure that the only substantive difference was the presence of AR. It should be noted that while the control group had no AR content, they were not deprived of engagement – the teacher used pictures and questions as normally done, but these were static and from the textbook, rather than interactive.

In Week 4, after all texts were covered, the posttest reading comprehension assessment was administered to both groups under identical conditions to measure learning gains. Additionally, the AR Attitude Scale was given to the experimental group to quantify their receptiveness to the AR learning experience. On the qualitative side, shortly after the posttest, one-on-one interviews were conducted with a subset of students (12 from the experimental group and, for comparison, 6 from the control group). Each interview lasted about 10–15 minutes. For experimental students, questions probed their experience with AR: e.g., "What did you like or not like about reading with augmented reality?" and "Do you think the AR features helped you understand the story better? Why or why not?" For control students, questions focused on their experience with the texts and any difficulties, serving as a secondary comparison for student engagement levels. All interviews with experimental group students were audio-recorded and later transcribed for analysis. The interview with control students aimed to ensure that any differences in engagement noted in the experimental group were indeed due to AR and not some other factor; these students were asked if they found the texts interesting and what could have made the reading more engaging, often yielding responses that implicitly highlighted the absence of interactivity in their reading sessions.

Data Analysis

The data analysis strategy employed both quantitative and qualitative approaches to comprehensively evaluate the effects of AR-enriched texts on students' reading comprehension.

For the quantitative analysis, descriptive statistics were computed for all variables, including means and standard deviations for pretest and posttest scores. Assumptions of normality were examined using the Shapiro–Wilk test, and homogeneity of variances was verified with Levene's test. Since these assumptions were satisfied, parametric procedures were applied. To address the first research question, paired-samples t-tests were conducted within each group to examine pretest–posttest changes. Independent-samples t-tests were employed

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to compare posttest performance between the experimental and control groups. Effect sizes were calculated using Cohen's *d* in order to assess the practical significance of the findings. To address the second research question, Pearson product–moment correlations were conducted to examine the association between reading proficiency and attitudes toward AR. All quantitative analyses were performed using IBM SPSS Statistics (Version 25), with the significance threshold set at $\alpha = .05$.

For the qualitative analysis, transcribed student interviews were examined using inductive content analysis following the procedures described by Elo and Kyngäs (2008). This approach allowed themes to emerge directly from the data without the imposition of predefined categories. Two independent researchers coded the transcripts, and inter-rater reliability was established through discussion and consensus on discrepancies. The emergent themes were subsequently compared with the quantitative results to ensure methodological triangulation and to provide deeper insights into the mechanisms underlying the observed improvements. Five major thematic categories were identified: (1) Increased Engagement and Enjoyment, (2) Enhanced Comprehension Support, (3) Focus and Attention, (4) Technical Challenges, and (5) Suggestions for Improvement.

Research Results

Reading Skill Improvement

The findings showed a significant improvement in reading comprehension for students who engaged with AR-enriched Turkish texts. As indicated by the paired-samples *t-test* results (Table 1), the experimental group's mean reading comprehension score increased markedly from pretest ($M = 11.95$, $SD = 2.44$) to posttest ($M = 16.45$, $SD = 1.85$), while the control group's performance remained statistically unchanged. These gains were not only statistically significant but also meaningful in terms of educational effect, as the experimental group demonstrated enhanced abilities in summarizing, interpreting, and inferring textual information.

Table 1
Comparison of Correct Answer Scores between Experimental and Control Groups

Group	Pretest *M*	*SD*	Posttest *M*	*SD*	*t*	*p*	Cohen's *d*
Experimental (n=24)	11.95	2.44	16.45	1.85	7.62	< .001	1.56
Control (n=24)	11.91	2.13	12.54	2.27	1.12	> .05	0.23

In Table 1, paired-samples *t*-test results indicated a significant improvement in the experimental group with a large effect size ($d = 1.56$), while the control group showed no significant change ($d = 0.23$).

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Table 2
Comparison of Reading Skills Between Experimental and Control Groups (Posttest)

Group	Posttest *M*	*SD*	*t*	*p*	Cohen's d
Experimental (n=24)	16.45	1.85	4.35	< .001	1.89
Control (n=24)	12.54	2.27			

When comparing the two groups post-intervention, the independent-samples *t*-test results show that the experimental group significantly outperformed the control group ($p < .001$), with a large effect size (Cohen's $d = 1.89$). This finding supports the hypothesis that AR integration has a positive effect on reading skills in primary school students, particularly by offering visual and interactive support that scaffolds learners' understanding of complex or abstract textual content.

Furthermore, higher-order reading skills such as predicting outcomes and making inferences were better developed in the experimental group. These improvements can be attributed to the multimodal nature of AR content, which helped students visualize, hear, and process information more effectively. For instance, students were better able to recall story events, understand figurative language, and apply context clues to derive word meanings.

Attitudes and Engagement

The attitude data indicated a strong positive reception of AR among students in the experimental group. Descriptive statistics from the AR Attitude Scale are presented in Table 3.

Table 3
Descriptive Statistics of AR Attitude Scale (Experimental Group)

Dimension	*M*	*SD*
Enjoyment	4.42	0.53
Willingness to Use	4.36	0.59
Usage Anxiety	1.28	0.47
Overall Attitude	4.30	0.48

Students rated their enjoyment and willingness to use AR in the future highly, while their anxiety levels remained low. The moderate positive correlation ($r = .45$) between attitude scores and reading performance is shown in Table 4 and underscores the motivational potential of AR. This finding suggests that AR not only enhances learning outcomes but also increases students' willingness to engage with reading tasks.

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Table 4
Correlation Between AR Attitudes and Reading Comprehension Proficiency

Measure	Correlation *(r)*	*p*
Posttest Reading Score & AR Attitude Score	.45	< .05

A moderate positive correlation ($r = .45$, $p < .05$) was found between students' attitudes toward AR and their reading comprehension performance. This suggests that more favorable attitudes toward AR were associated with higher reading scores; however, this relationship is correlational and does not imply causation.

Qualitative Findings from Student Interviews

The interview data provided rich, contextual evidence that supported the quantitative findings, shedding light on how augmented reality (AR) transformed students' reading experiences. Participants from the experimental group consistently described the AR-based reading activities as immersive, engaging, and highly stimulating. Many students expressed that the stories "came to life" through the dynamic visual and auditory elements, which not only captured their interest but also enhanced their ability to visualize and internalize the content. One student enthusiastically stated, *"When the AR animation started, it felt like I was watching a movie made from the book. It made the story real for me, and I didn't want to stop reading."* Another remarked, *"I usually get distracted after a few minutes, but AR made me curious about what would happen next, so I kept reading without getting bored."*

This heightened engagement manifested in longer periods of focused attention and a greater willingness to complete reading tasks. Students referred to the AR components as "checkpoints" or "rewards" that motivated them to continue reading attentively. One student commented, *"I read more carefully because I knew something would appear—an animation or sound—if I understood the part correctly. It was like a game that helped me focus."* These reflections suggest that AR features served not only as motivational tools but also as embedded comprehension scaffolds, encouraging deep processing of the text.

In addition to engagement, students highlighted how the multimodal AR elements facilitated comprehension. For example, visual reconstructions of historical sites or events helped students better understand descriptive passages in informational texts. One student explained, *"When I saw the ancient building in 3D, I understood its shape and parts much better than just reading the description."* Similarly, the AR-read-aloud function in literary texts enhanced students' understanding of tone, rhythm, and emotional nuance, which are often difficult to grasp through silent reading. *"When I heard the poem read aloud with the right emotion, I felt what the poet was saying,"* a student reflected, pointing to AR's role in supporting both cognitive and affective aspects of reading.

Despite the generally positive feedback, some students encountered technical issues at the beginning of the intervention, such as difficulty aligning the tablet camera with the AR markers or brief delays in content loading. These minor frustrations, however, diminished over time with teacher guidance and increased familiarity. Teachers provided troubleshooting strategies, including optimal device positioning and patience during app loading. By the second week, nearly all students reported using the AR features independently and smoothly. Importantly, even those who experienced technical difficulties expressed continued enthusiasm for the AR-enhanced readings, indicating that the educational benefits and novelty of the experience outweighed any initial setbacks.

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In contrast, students in the control group reported more neutral or indifferent attitudes toward their reading lessons. Their comments often reflected a lack of excitement or emotional engagement. Typical responses included statements such as, *"It was just normal reading,"* or *"Sometimes I lost interest when the story was long."* Some admitted they skipped parts of the texts when they felt tired or bored, which may partially explain the comparatively lower comprehension scores observed in the quantitative analysis. The absence of interactive or sensory stimuli in the control group's reading experience appeared to limit their sustained attention and intrinsic motivation.

These contrasting accounts between the experimental and control groups reinforce the conclusion that AR not only enhances cognitive learning outcomes, such as reading comprehension and vocabulary acquisition, but also transforms the affective and motivational dimensions of the learning experience. The qualitative findings suggest that AR's multimodal affordances—through visual, auditory, and interactive content—can promote deeper engagement, increased comprehension, and greater learner autonomy, particularly when thoughtfully integrated into literacy education and supported by curriculum-aligned reading activities.

Discussion

The findings of this study align with and extend the growing body of literature on augmented reality (AR) in education. In particular, the significant improvement in reading comprehension observed in the AR-enriched group (Cohen's $d = 1.56$) highlights AR's potential as an effective educational tool for literacy development. This large effect size is consistent with those reported in prior empirical studies and recent meta-analyses, thereby reinforcing the robustness of the current results. For example, Çetinkaya Özdemir and Akyol (2021) reported enhanced comprehension in elementary students using AR, while Zeybek and Sayın (2022) and Bursali and Yilmaz (2019) found gains in both comprehension and motivation with AR-based reading activities. At an international level, Garzón et al. (2019) conducted a meta-analysis showing consistent positive effects of AR on learning outcomes, particularly in reading comprehension when AR was integrated as a supplementary support. Similarly, Zhang et al. (2022) and Na and Yun (2024) reported large effect sizes for AR in K–12 contexts, underscoring its value for improving both achievement and motivation. By demonstrating the effect of AR-enriched texts in a Turkish primary education context, this study contributes additional evidence that AR's benefits for reading are not confined to a single language or curriculum but may be generalizable across diverse educational settings. In doing so, it also reflects ongoing discussions in the journal about the integration of innovative educational technologies and the importance of infrastructure, teacher preparedness, and equitable access (Durso & Arruda, 2022).

The substantial gains in the experimental group's ability to summarize and recall information indicate that AR supports not only literal comprehension but also higher-order thinking skills. A plausible explanation is that AR's interactive and multimodal presentation reinforces cognitive processing, in line with dual-coding theory, where information presented both visually and verbally creates stronger memory traces. In the AR condition, students simultaneously heard, saw, and read content, engaging multiple senses, which likely facilitated deeper processing and better retention, as reflected in their performance and feedback. Similar multimodal benefits of AR have been highlighted in international studies (e.g., Garzón et al., 2019; Radu, 2014; Vidak et al., 2023), reinforcing the view that AR's strength lies in combining visual, auditory, and textual input in a cohesive learning experience.

The positive attitudes toward AR and the moderate correlation between attitudes and reading performance are also noteworthy. This suggests a reciprocal relationship where engaging educational methods promote both enjoyment and achievement, which in turn further

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motivates learners. These findings align with motivational frameworks, such as the ARCS model (Attention, Relevance, Confidence, Satisfaction). In this study, AR clearly captured students' attention and provided relevance by linking interactive content directly to lesson objectives. Qualitative data add depth to this result by revealing that students perceived AR reading sessions as exploratory and playful rather than obligatory tasks, echoing findings from Alsowat (2017) and Bursali and Yilmaz (2019), showing that AR can increase both engagement and comprehension by making reading more interactive and enjoyable. This is also consistent with Na and Yun's (2024) meta-analysis, which shows AR's strong motivational effects in K–12 students.

A further contribution of this study lies in highlighting AR's potential as an embedded scaffold for comprehension. Students frequently reported that AR content helped clarify or visualize what they read. This aligns with Vygotsky's concept of the Zone of Proximal Development (ZPD), as AR acted as just-in-time support, enabling learners to achieve a higher level of comprehension than they might with text alone. The immediacy and availability of these supports distinguish AR from static media, suggesting that integrating multimodal cues directly into the reading process can facilitate independent learning. These findings extend the work of Radu (2014), Garzón et al. (2019), and Nevrelova et al. (2024), offering additional evidence of AR's capacity to provide embedded scaffolding that enhances both comprehension and learner autonomy.

In addition to cognitive outcomes, the findings suggest AR may foster metacognitive skills. Several students reported paying closer attention to details in anticipation of AR content and described strategies such as previewing and revisiting passages to connect text with interactive elements. These behaviors reflect metacognitive monitoring and active reading strategies, which are critical in developing literacy. This extends current research by suggesting that AR's novelty and interactivity can prompt students to engage in deeper, self-regulated learning behaviors, offering an avenue for future longitudinal studies to explore whether such strategies persist beyond the AR environment.

While the findings indicate a generally positive effect of AR, limitations must be acknowledged. The quasi-experimental design using intact classes introduces potential biases, as random assignment was not feasible. Pre-existing differences between the two classes (e.g., teacher dynamics, classroom culture, peer interactions) could have influenced the results, despite pretest equivalence. The experimental and control groups were taught by the same teacher to minimize teacher effects, but subtle differences in implementation or enthusiasm could still have occurred. Additionally, the study was relatively short-term (one month) and employed a controlled set of texts, providing proof-of-concept rather than evidence of long-term outcomes. It remains to be seen whether the observed gains would sustain over an academic year or whether the novelty effect would diminish over time. These questions point to the need for longitudinal research examining sustained AR integration and teacher-led implementations in real classroom contexts. Although technical issues were minimal in this study, they underscore the importance of reliable infrastructure and teacher training for scaling AR in diverse educational settings.

The findings also carry implications for curriculum design and policy. The positive outcomes highlight the potential for integrating AR components into reading materials, particularly for content students often find challenging or less engaging, such as classical literature or dense informational texts. By embedding multimodal support within curriculum-aligned materials, AR can help create more adaptive and student-centered literacy experiences. Furthermore, as digital literacy becomes increasingly vital, AR-based reading activities not only strengthen traditional literacy but also prepare students to navigate multimodal texts, a key competency in 21st-century education (Nevrelova et al., 2024). However, successful implementation requires professional development to help teachers facilitate AR-based learning effectively and to balance student-led exploration with structured teacher guidance.

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Overall, the study provides new evidence that AR, when thoughtfully designed and aligned with educational objectives, holds promise for enhancing both cognitive and motivational aspects of literacy learning. The results demonstrate that educational technology can address concrete classroom challenges, such as improving comprehension and engagement in reading. Moreover, the findings emphasize the importance of pedagogy-driven design in leveraging AR effectively and highlight avenues for extending this work into other subject areas and diverse learning environments. Ultimately, this research contributes to the evolving understanding of how AR can enhance literacy development and provides insights for integrating multimodal digital tools into curricula in culturally and linguistically responsive ways.

Conclusions and Implications

This study provides evidence that AR-enriched reading materials can meaningfully improve primary students' comprehension and motivation when thoughtfully integrated into curriculum-based activities. The results indicate that AR's multimodal features enhance literal understanding of texts and support higher-order skills such as inference and summarization, while also fostering more positive attitudes toward reading.

These findings carry several practical implications. Embedding AR components into reading materials - especially for content that students often find challenging - can make literacy experiences more engaging and effective. However, the design and implementation of such materials require careful pedagogical alignment, ensuring that technology supports, rather than overshadows, learning objectives. Teacher training remains essential for equipping educators with the skills to integrate AR effectively and manage classroom dynamics. At the curriculum and policy level, incorporating AR can contribute to the development of multimodal literacy, an increasingly relevant competency in contemporary education. Schools adopting AR should also consider infrastructure and equity issues to ensure broad access and sustained technical support.

Despite these promising results, the study has important limitations. The short-term intervention design limits conclusions about the durability of effects, and no direct measures of accessibility or metacognitive processes were included. While student reports indicated deeper engagement, further research is needed to examine whether AR systematically promotes metacognitive strategies. Future studies should investigate long-term outcomes, scalability across diverse learning contexts, and the design features of AR that best balance interactivity with cognitive load.

Taken together, the findings point to AR as a promising pedagogical tool that can enrich reading practices when integrated with sound educational objectives and supported by well-prepared teachers. Its potential should be understood within the boundaries of this study's design, with future research needed to clarify its broader applicability and sustainability.

Ethical Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and national research committee, as well as with the 1964 Declaration of Helsinki and its subsequent amendments. Ethical approval was obtained from the Ethics Committee of Zonguldak Bülent Ecevit University (Türkiye) under protocol number 380, dated November 30, 2022. Informed consent was obtained from all participants prior to data collection.

Declaration of Interest

The authors declare no competing interest.

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PEER BULLYING AND COPING STRATEGIES IN CHILDREN: INSIGHTS FROM MAINSTREAM PRIMARY SCHOOLS

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Abstract

While peer bullying has become one of the most critical issues that today's education systems must address, the bullying experiences of primary school children and their coping strategies remain insufficiently understood. The present study sought to explore in depth whether mainstream primary school students are exposed to peer bullying and, if so, how they cope with this problem. Interviews were held with 13 Turkish primary school students (Mage=10.76), the majority of whom were victims, and one of them was a bully. The study group consisted of nine boys (Mage=10.88) and four girls (Mage=10.5). Data were collected through a semi-structured interview form developed by the researchers. Among participants, physical bullying is experienced the most. It is followed by verbal and emotional bullying. No sexual bullying case was reported. Victims employed various coping strategies, most of which were individual-oriented, such as ignoring the bullying or warning the bullies. However, the most frequently reported strategies were adult-oriented, particularly involving class teachers. Familial (e.g., parental divorce), psychological (e.g., feelings of maternal abandonment), and socio-economic (e.g., financial hardship) challenges may underlie the emergence of bullying behaviours.
Keywords: *behaviour problems, children, coping strategies, peer bullying, primary school*

Introduction

According to the most recent report published by UNICEF, around half of 13-15-year-old students (approximately 150 million students) all over the world are exposed to peer bullying in and around schools (UNICEF, 2018). Many definitions addressing the various aspects of "bullying" have been produced over decades. Bullying is defined as a form of aggressive behaviour that intentionally and repeatedly causes harm and distress to another person over time, involving an observed or perceived power imbalance (APA, 2022; Gladden et al., 2014; Gutiérrez et al., 2008). Olweus (1994) emphasized that bullying refers to the repeated and prolonged exposure to negative actions, whether physical, verbal, or psychological. Glew et al. (2008) defined bullying as any repetitive negative activity or aggression aimed at harming or disturbing someone who is perceived as physically or psychologically weak by the aggressor peer. Consequently, there is a consensus that bullying behaviour includes three defining characteristics: the action must be intentional and continuous, it involves an imbalance of power, and it harms the victim verbally, physically, or psychologically.

It is important to clarify the distinction between aggression and bullying in the literature. Bullying is characterized by three core elements: intentionality, repetition, and an imbalance of power (Olweus, 1994; Smith, 1997). While aggression may be a single or occasional act of harm, bullying involves systematic and repeated harm directed from a more powerful individual to a

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less powerful victim. This conceptual clarity is essential to avoid confusing general aggressive acts with bullying behaviours, which require specific criteria to be met.

On the other hand, the victims often struggle to defend themselves and feel helpless against peer bullying. To consider a behaviour as bullying, it must be deliberately intended to cause harm, it must be persistent, and there must be an imbalance of power between the bully and the victim. Therefore, peer bullying commonly includes physical contact (*i.e., kicking, pulling hair, hitting*), verbal teasing (*i.e., swearing, nicknaming*), making obscene gestures (*i.e., touching their private parts*), and deliberately excluding others from a group. (Graham, 2016; Mapes et al., 2020; Perren & Alsaker, 2006; Rigby, 2003; Smith, 1997).

Individuals who initiate and perpetuate bullying behaviour are defined as bullies. Because they often have poor problem-solving skills, they tend to externalize their internal problems (Sarzosa & Urzua, 2021). In general, the bullies have low academic achievement and take pleasure in inflicting pain and harm on their victims. Their lack of empathy also contributes to the development of defence mechanisms that justify their behaviour, often by blaming the victim for provoking the situation (Jolliffe & Farrington, 2006; van Noorden et al., 2015). In addition, such students are often antisocial children who tend to disobey school rules (Gürhan, 2017). Bullying can cause psychological, social, or educational harm or distress to the victim, and it may result in victims becoming more isolated from their environment day by day. Peer bullying, which can occur both in school and out of school, can also cause victims to feel powerless, intimidated, and humiliated, and can lead to low academic achievement (Feyzi Sezen & Murat, 2018; Uysal & Dinçer, 2012).

Peer bullying is considered to be an important issue at any grade of primary school, with serious consequences for both bullies and victims (Salmivalli, 2010; Zerillo & Osterman, 2011). This is because bullying among school-age adolescents affects their well-being, social functioning, and health status (Humphrey & Crisp, 2008; Gürhan, 2017; Nansel et al., 2001). To prevent bullying in schools and to provide solutions, it is important to examine the underlying factors of bullying in depth, both in terms of the bullies and the victims because bullying behaviours that are ignored or disregarded can result in victims being constantly targeted and harassed which can have lifelong consequences for them (Beaty & Alexeyev, 2008; Whitted & Dupper, 2005). Although many studies (Adalar Çelenk & Yıldızlar, 2019; Arslan et al., 2012; Cheraghi & Pişkin, 2011; Çarkıt & Bacanlı, 2020; Gladden, et al., 2014; Gutiérrez et al., 2008; Karabacak et al., 2015; Öztürk et al., 2019) examining peer bullying among Turkish adolescents and youth, there is a notable lack of research examining bullying behaviours in primary schools. Only one study (Eroğlu & Kılıç, 2020) was found in the literature that dealt with peer bullying behaviour among primary school children with autism spectrum disorder. However, the question of whether there is a problem of peer bullying among Turkish mainstream primary school students remains unanswered. Therefore, the present study aimed to fill this gap by examining in depth whether mainstream primary school students are exposed to peer bullying and, if so, how they try to cope with this problem.

Although several studies have explored peer bullying among Turkish adolescents, the literature significantly lacks detailed, qualitative investigations of bullying experiences among mainstream primary school children. Unlike prior research, which predominantly relied on quantitative data or focused on adolescents or children with special needs, the present study employs a qualitative, in-depth approach to explore the lived experiences of bullying and coping strategies among typically developing primary school students. By doing so, this research not only addresses an understudied population but also offers rich, contextual insights that can inform more developmentally appropriate prevention and intervention strategies for younger children. In this regard, the following questions were attempted to be answered.

Q1. What types of peer bullying situations are seen among the participants?

Q2. What kind of coping strategies were utilized by bullied participants?

Q3. What are the reasons for peer bullying?

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Research Methodology

Design

In the study, a case study design, one of the qualitative research designs, was employed. The aim of the case study is to obtain comprehensive, systematic, and in-depth information about the examined case (Patton, 2015). The present study, conducted during the 2023-2024 academic year, aimed to explore as comprehensively and deeply as possible the types of peer bullying experienced by primary school children and the coping strategies they employed.

Participants

In the present study, a criterion sampling method was utilized to recruit the participants. Being a bully, victim or both were considered as criteria. Participants were selected based on the interview conducted with the class teacher. Since she had been teaching the students for four years, it was assumed that she had decent experience with them. As a result, 13 Turkish primary school students, aged 10 to 12 (Mage = 10.76), studying in the fourth grade, were recruited. The study group consisted of nine boys (M_{age} = 10.88) and four girls (M_{age} = 10.5). Similarly, studies (Obregon-Cuesta et al., 2022; Sarzosa & Urzúa, 2021) reported that bullying behaviours are more prevalent among boys compared to girls. All students except one had pre-school education, and their parents live together. A student did not have a pre-school education, and his parents live separately. All participants' parents were alive. Participants were informed about the study and assured that their participation was completely voluntary, with the option to withdraw at any stage of the research if they wished. Written consent form was obtained from the parents of the children.

Measurement Tool

Data were collected through semi-structured interviews as they provide a flexible yet focused framework to explore the participants' subjective experiences of bullying and their coping strategies in depth. This method allows researchers to probe beyond surface-level responses, enabling children to express their thoughts, emotions, and experiences in their own words–an especially valuable approach when working with younger participants. Given that bullying is a sensitive and complex phenomenon that may vary across contexts and individuals, the use of semi-structured interviews was deemed suitable for eliciting rich, nuanced data aligned with the study's exploratory goals.

A semi-structured interview form developed by the researchers and a personal information form were used to collect data. To create the interview form, relevant literature and assessment tools were reviewed, and the created draft form was reviewed by three field experts (two field experts and one assessment and evaluation specialist). The draft form was revised in line with the feedback of field experts and re-sent for their approval. After approval, the semi-structured interview form was finalised. The data regarding the students' demographic information and the variables (*i.e., age, gender, parental status [alive/dead or married/divorced], having pre-school education*) that are thought to influence peer bullying or coping strategies were gathered through the personal information form.

To ensure conceptual clarity, the semi-structured interview questions were designed to capture the key features of bullying–intentionality, repetition, and power imbalance. Participants were asked not only to describe the incidents but also to clarify their frequency and their perceived ability to respond (e.g., *Did this happen just once or did it happen multiple times?*; *Could you say no or stop the person doing this to you?*), allowing for a clear distinction between

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isolated aggression and systematic bullying. The questions also explored children's perceptions and coping strategies without implying personal responsibility (e.g*., In such a situation, do you respond in any way? If so, how?).* Given the young age of participants, it is acknowledged that their explanations reflect subjective perceptions rather than an objective understanding of the aggressors' motives.

Procedure

After obtaining the parents' consent, face-to-face interviews with the primary school children were held in a proper room provided by the school administration. Before the interviews, the participants were informed about the study, and they were assured that the data obtained would not be shared with third parties and that they could withdraw from the study at any stage of the research if they wished to. With the permission of the participants and the school administration, interviews were recorded with a voice recorder device in order to prevent data loss. Interview sessions lasted between 12 and 28 minutes.

The Experiences of the Researchers

It is highly important that researchers possess knowledge and experience regarding the subject of the study to conduct both the data collection and coding processes effectively. The researchers had extensive prior experience with qualitative research and the qualitative analysis process. Additionally, before the interviews, the researchers interacted individually with both the classroom teacher and the participants to gain familiarity with the participants. Moreover, prior to starting the formal interview, a brief general conversation—unrelated to the interview topic–was held with each participant to help reduce any potential tension or anxiety.

Inter-Coder Reliability (ICR)

To ensure inter-coder reliability, some parts of the data (30%) were coded by two experienced coders. Both coders have experience in qualitative analysis and qualitative studies. Disagreements during the coding process were resolved by a joint solution of the coders or by consulting an experienced third coder. In case a consensus could not be reached among three researchers, then the decision of the majority (two researchers) was applied.

Participant Validation

In the content analysis process, it is crucial for validity that the codes generated by the coders accurately reflect the participants' actual intentions (Creswell, 2009; Merriam, 2015). To ensure this, at the end of each interview, participants were provided with a summary of their statements and were asked whether there was anything they would like to add or if there was any misunderstanding by the researchers. Additionally, during the interviews, the participants were occasionally asked clarifying questions such as "Is this what you meant?" or "Did I understand you correctly?" to confirm the accuracy of their statements.

Analysis

The data derived from the primary school children were transformed into a Word document. A qualitative content analysis technique, which is basically defined as "a set of procedures to make inferences from text" (Weber, 1990), was provided through the qualitative data analysis program (MAXQDA, version 2020) to reach the codes and categorizations. In

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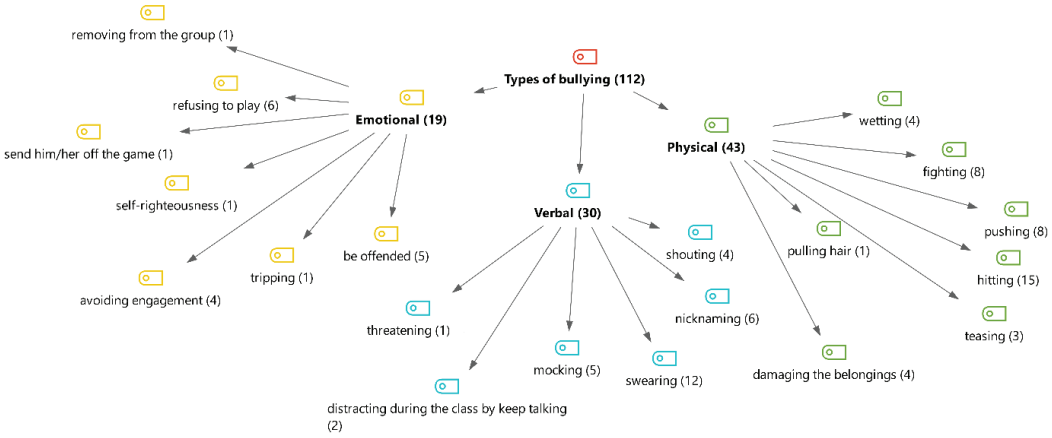
qualitative content analysis, the researcher constructs the analytical contexts themselves; in doing so, they act with an awareness of acknowledging others' worlds, pursuing their own research questions, and adopting analytical frameworks based on existing literature or prior knowledge related to the context of the texts being analysed (Krippendorf, 2004).

Research Results

Types of Peer Bullying

The first research question focused on identifying the types of peer bullying experienced by participants. Interview data indicated that students had encountered physical, verbal, and emotional bullying during school hours. The possibility of sexual bullying was also explored; however, all participants explicitly denied any such experiences involving either peers or adults. A summary of bullying types is provided in Figure 1.

Figure 1
Distribution of Bullying Types and Sub-codes



As shown in Figure 1, physical bullying emerged as the most frequently reported category (code frequency[cf] = 43), followed by verbal (cf = 30) and emotional bullying (cf = 19). The most common physical bullying behaviours included *hitting* (cf = 15), *pushing* (cf = 8), and *fighting* (cf = 8). In the verbal category, *swearing* (cf = 12), *nicknaming* (cf = 6), and *shouting* (cf = 4) were most frequently mentioned. Emotional bullying primarily involved *exclusion from play* (cf = 6), *taking offense* (cf = 5), and *social withdrawal* (cf = 4). Illustrative excerpts from participant narratives are presented below to contextualize these findings:

> **P3:** My desk mate takes my notebook and throws it in the bin while I'm studying (*physical bullying – damaging the belongs*).
> **P5:** Students, mostly not from our class but from other classes, swear at me and my friends and run away. **Researcher:** Why? I do not know why, and I do not even know these people very well. I think it is for fun (*verbal bullying – swearing*).
> **Researcher:** Don't you talk to him? **P2:** No. Me and my close friends do not interact with him much. He always tries to hang out with us. Of course, I don't want him to walk around with me. (*emotional bullying, avoiding engagement*).

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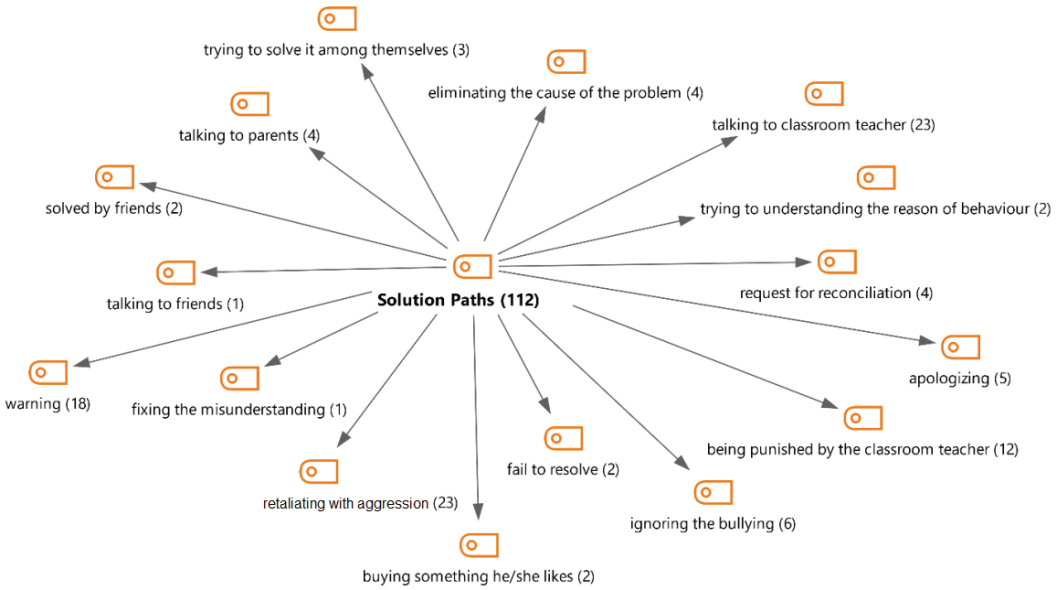
Coping Strategies for Bullying Behaviours

Interview data revealed multiple coping strategies employed by students in response to bullying (Figure 2). The two most frequent responses were retaliating with aggression (cf = 23) and seeking teacher intervention (cf = 23), reflecting distinct approaches—individual retaliation versus reliance on institutional authority. A secondary but notable strategy involved teacher-imposed punitive measures (cf = 12), which emerged as an extension of teacher intervention. Punishments typically took non-physical forms, such as recess restrictions or repetitive writing tasks, as illustrated by **P10**: "When my friend hit me, I told the teacher. [The teacher] made him write 50 times, 'I shouldn't hit my friend.'"

Students frequently employed *retaliatory aggression* as a response to bullying, exemplified by physical retaliation (**P2**: *"I hit him too every time for self-defence"*; **P12**: *"I pushed him to the ground… just to scare him"*) and verbal aggression (**P6:** *"I swear at them when angry"*). These behaviours suggest a cyclical escalation of peer aggression. Other coping strategies included *passive avoidance* (ignoring; cf = 6), *conflict resolution* (apologizing, cf = 5; reconciliation-seeking, cf = 4), and *problem-solving* (eliminating the cause; cf = 4).

Figure 2
Coping Strategies Employed by Students Experiencing Peer Bullying


trying to solve it among themselves (3)
eliminating the cause of the problem (4)
talking to parents (4)
talking to classroom teacher (23)
solved by friends (2)
trying to understanding the reason of behaviour (2)
talking to friends (1)
Solution Paths (112)
request for reconciliation (4)
apologizing (5)
warning (18)
fixing the misunderstanding (1)
being punished by the classroom teacher (12)
fail to resolve (2)
retaliating with aggression (23)
ignoring the bullying (6)
buying something he/she likes (2)

Reasons for Peer Bullying

Analysis of participants' explanations for engaging in or witnessing peer bullying yielded 13 distinct codes (Figure 3). Unlike responses to RQ1 and RQ2, no single code emerged as dominant regarding bullying motivations. Notably, a substantial proportion of participants (cf = 11) reported being unable to discern any clear rationale for bullying behaviour. Gender emerged as a salient factor (cf = 4), with participants indicating that bullying predominantly occurs within same-gender peer groups. This pattern aligns with reported interaction norms, where students primarily socialized with same-gender peers (e.g., boys playing with boys). Male students appeared particularly vulnerable, reporting higher exposure to bullying compared to their female counterparts. Additionally, some participants noted displaying greater tolerance toward opposite-gender peers relative to same-gender peers. For example:

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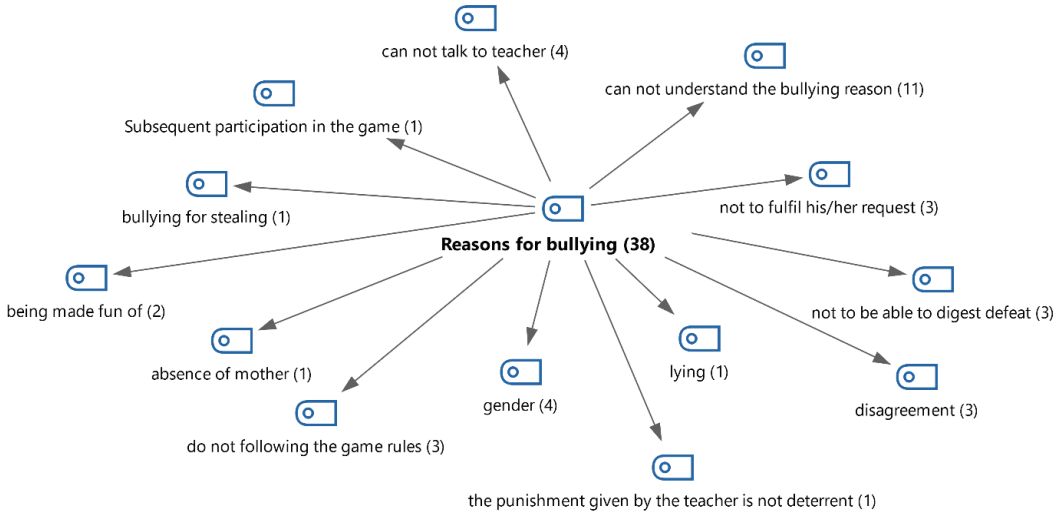
P6: *I usually have bullying problems with boys. Because I do not prefer to play with girls.*
P9: *My friends used to call me nicknames. At first, I warned them, but I did not work and I had to do other things. I got so angry, and frustrated, and I wanted to hit them. They got scared and stopped calling with nicknames.* **Researcher:** *Is it the same with girls?* **P9:** No, I didn't do it to girls. I only did it with boys. **Researcher:** What did you tell the girls? **P9:** They stopped doing it immediately when I warned them once or twice.

Figure 3
Reasons for Peer Bullying


can not talk to teacher (4)
can not understand the bullying reason (11)
Subsequent participation in the game (1)
bullying for stealing (1)
not to fulfil his/her request (3)
Reasons for bullying (38)
being made fun of (2)
not to be able to digest defeat (3)
absence of mother (1)
lying (1)
gender (4)
disagreement (3)
do not following the game rules (3)
the punishment given by the teacher is not deterrent (1)

Students identified several key factors contributing to bullying incidents. A significant barrier reported was the perceived inability to report bullying incidents to teachers. Additionally, participants cited multiple interpersonal triggers, including being made fun of (*cf* = 2), disagreement (*cf* = 3), not following the game rules (*cf* = 3), not being able to digest defeat (*cf* = 3), and not to fulfil his/her request. These findings suggest that bullying behaviours often stem from social conflicts and perceived rule violations within peer interactions, compounded by barriers to adult intervention.

Discussion

Children who are bullied tend to be less assertive, more easily emotionally distressed, and less effective in conflict resolution than other children (Perren & Alsaker, 2006; Healy, 2015), and have difficulty defending themselves (Olweus, 1994). As a result of bullying, many students' educational life as well as their daily life can be negatively affected. For some children, the effects of bullying are not limited to school time, but also continue in adult life (Healy et al., 2015). Therefore, the present study aims to provide an in-depth examination of the bullying behaviours experienced by children in the early stages of their educational journey, the underlying factors contributing to these behaviours, and the strategies employed by the children to cope with or overcome bullying.

Participants reported experiencing various forms of bullying, with physical bullying being most prevalent, followed by verbal and emotional bullying. This finding is consistent with previous research (Çankaya, 2011; Çarkıt & Bacanlı, 2020; Çınkır & Karaman-Kepenekçi, 2003; Gültekin Akduman, 2012; Kartal & Bilgin, 2008; Özkan & Çifci, 2010; Pişkin, 2010; Polat & Sohbet, 2020). Physical bullying primarily manifested as hitting, pushing, and fighting, while

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verbal bullying included swearing, nicknaming, mocking, and shouting. Emotional bullying, though less frequent, involved behaviours such as social exclusion and intentional offending. These findings align with Wiertsema et al.'s (2023) meta-analysis, which demonstrated that bullies often face peer rejection. Regardless of type, bullying has been associated with negative outcomes, including poor social and emotional adjustment, friendship difficulties, school absenteeism, rule noncompliance, anxiety, depression, self-harm, and suicidal tendencies (Beaty & Alexeyev, 2008; Lereya et al., 2015; Skybo, 2005). Furthermore, bullying behaviours adversely affect school climate (Polat & Sohbet, 2020). While no instances of sexual bullying were reported in this study, existing literature indicates its presence in similar age groups (Çınkır & Karaman-Kepenekçi, 2003; Kapcı, 2004), with potential contributing factors including student age, school socioeconomic status (Özkan & Çifci, 2010), and presence of disabilities (Contreras et al., 2021).

Victims employed various coping strategies, most of which were individual-oriented (12 out of 15), such as ignoring the bullying or warning the bullies. However, the most frequently reported strategies were adult-oriented, particularly involving class teachers (talking to the teacher, cf = 23; teacher-imposed punishments, cf = 12). The third most common strategy was retaliatory aggression (cf = 23). These results suggest that while multiple coping strategies exist, victims predominantly rely on authoritative figures for resolution, a finding supported by existing literature (Kutlu & Karaca, 2021; Purcell, 2012). Notably, teachers tended to employ non-physical punishments. Retaliatory aggression emerged as a concerning strategy, potentially perpetuating cycles of bullying. Some victims also adopted avoidance strategies, effectively creating their own punishment systems by excluding bullies.

Participants identified no single dominant reason for bullying behaviours, with many unable to comprehend the motivations behind bullying. This uncertainty may stem from the fact that bullying primarily originated from one student (P6), whose personal circumstances provided insight into potential causes. P6, a 12-year-old male, had experienced teacher violence in first grade, leading to temporary school withdrawal. His parents were divorced, and he lived with his father and siblings, expressing feelings of maternal abandonment. The family's socioeconomic situation was precarious, with the father as the sole provider, requiring P6 to assist with household responsibilities. These factors align with Contreras et al.'s (2021) multifactorial explanation of bullying, which incorporates individual, familial, and school-related influences. Shams et al. (2017) identified five key factors: psychological (e.g., mental health issues), familial (e.g., domestic violence), school-related (e.g., teacher conduct), socioeconomic (e.g., poverty), and media influence (e.g., violent video games). In P6's case, familial instability, socioeconomic hardship, and psychological distress appear particularly relevant.

Gender also emerged as a significant factor, with male students reporting higher bullying exposure than females, consistent with previous research (Camodeca et al., 2002; Çankaya, 2011; Baker & Kavşut, 2007; Fekkes et al., 2005; Kartal & Bilgin, 2008; Öztürk et al., 2019; Polat & Sohbet, 2020; Radwan et al., 2021; Sapouna, 2008). Bullying predominantly occurred within same-gender groups, reflecting typical peer interaction patterns. Additionally, some students reported reluctance to discuss bullying incidents with teachers due to perceived authoritarianism, potentially exacerbating unresolved cases.

Conclusions and Implications

The present study examined the nature of peer bullying in mainstream primary school settings through qualitative analysis of student experiences. Findings revealed that physical bullying was the most common type of aggression, followed by verbal and emotional forms. Students adopted a range of coping strategies, including seeking help from teachers or, in some cases, resorting to retaliatory behaviours. Bullying motivations appeared multifaceted,

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with familial instability, socioeconomic challenges, and psychological distress frequently emerging as contributing factors. Notably, boys experienced higher rates of same-gender victimization, and many students expressed reluctance to report incidents due to perceptions of teacher authoritarianism. These results highlight the complexity of bullying behaviours and the individual, familial, and contextual factors shaping them.

The findings suggest that effective intervention requires addressing not only behavioural outcomes but also the social and emotional dimensions influencing both victims and perpetrators. Schools should create more supportive and approachable reporting mechanisms to counter students' hesitations. Additionally, fostering teacher-student trust and recognizing underlying risk factors such as psychological distress or unstable home environments are critical. Future research should further explore how gender, teacher attitudes, and school culture intersect to shape children's bullying experiences. Longitudinal and mixed-method studies could provide deeper insights into the evolving nature of peer aggression and the long-term efficacy of prevention strategies.

Limitations and Future Research

The present study has some limitations that should be considered while interpreting the results and designing the future studies based on its key findings. The number of participants was limited as the study's focus was on an in-depth analysis of the specific case, and only Turkish children were included. This limitation restricts the extent to which broader generalizations can be made. Future research involving larger sample sizes and conducted in diverse cultural settings may help to compare and generalize the findings.

In addition, the study group predominantly consisted of victims, which may have led to bullying incidents being analysed mainly from the victims' perspective. However, understanding the viewpoints of bullies is also essential. Future qualitative studies in which at least half—or nearly half–of the participants are bullies could help fill this gap and provide a more balanced understanding.

Although this study did not measure happiness directly using quantitative scales, the qualitative data strongly suggest that bullying experiences negatively impact children's emotional well-being and, consequently, their overall happiness in school. Addressing bullying, therefore, requires holistic interventions that not only promote behavioural change but also support children's emotional needs and family contexts.

Ethics Approval

To conduct interviews with the participants, necessary permissions and approval were obtained from Balıkesir University Ethics Committee (No: E-19928322-302.08.01-27266).

Disclosure Statement

No potential conflict of interest was reported by the author(s).

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CONCEPTUALIZATIONS OF INCLUSIVE SCHOOLING BY PRE-SERVICE TEACHERS IN SLOVAKIA

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Abstract

Understanding how pre-service teachers conceptualize inclusive schooling is critical for effective teacher education. The present study examined how 455 pre-service teachers from eight Slovak universities perceive and prioritize eight distinct conceptualizations of an inclusive school, analyzing influences of professional specialization, study mode, and experience with diversity. A quantitative survey, utilizing ratings on a 6-point Likert scale and forced choice ranking, revealed "every child is valued" as the most preferred concept, signaling a strong normative commitment to individual children's worth. "Bottom-up inclusion," emphasizing practical, team-based approaches, also ranked highly. While no significant differences were found across teacher specializations or personal experience with diversity, part-time students showed stronger preference for "bottom-up inclusion" compared to full-time students, who prioritized "every child is valued". These findings suggest that professional experience may shape more practical conceptualizations of inclusion, underscoring the importance of structured reflection alongside practical experience in teacher education.

Keywords: *inclusive education, pre-service teachers, conceptualizations of inclusive schooling, quantitative survey*

Introduction

In recent decades, the issue of ensuring equal educational opportunities has become central to education policy worldwide. The belief that all children, regardless of their characteristics, have the right to be educated together in the school closest to their home is reflected in various international documents (European Commission, 2014; OECD, 2007; United Nations, 2006). Inclusive education has become a true global norm (Powell et al., 2015), a global agenda (Pijl et al., 1997), and a topic of political debate around the globe. Some authors even describe it as a cliché of modern educational systems (Emam & Mohamed, 2011). Today, inclusive education is widely accepted as a key criterion of educational quality (EADSNE, 2011; OECD, 2016, 2018).

However, Dyson (2004) has noted that while inclusive education may be framed as a global agenda, it should not be assumed that it has the same meaning in all contexts. Instead, inclusion must be seen as a set of discourses shaped by variation. The concept of inclusion is unstable, variable, and, as Booth (1995) described, slippery. These perspectives are rooted in the theory of the social construction of reality, particularly the work of Berger and Luckmann (1966), who have argued that social reality is shaped by historical, cultural, and social contexts. These contexts form conceptual frameworks that provide cognitive tools to interpret the world. As Fay (1999) metaphorically has suggested, people perceive and "read" reality through the cognitive lenses shaped by these frameworks.

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Further insight is offered by the theory of social representations, developed by Moscovici (1961), which explains how people collectively generate shared meanings through socially embedded discourse. Social representations, defined as systems of values, ideas, and practices (Moscovici, 1973), serve as interpretive codes that bind members of social groups together and help them classify and make sense of their world (Herzlich, 1973; Höijer, 2011). In this sense, the concept of inclusion also becomes a subject of shared interpretation.

Theories of social construction and social representation support the claim that inclusion is not a single reality (Booth, 1995; Dyson, 1999, 2004; Göransson & Nilholm, 2014; Savolainen et al., 2012). Cross-national comparisons show that the meaning of inclusion is shaped by economic, political, cultural, and historical factors. Artiles and Dyson (2004) have highlighted the contrast between high-income countries with established mainstream and special education systems, and low-income countries where special education has never been fully institutionalized. Such differences are shaped not only by structural factors but also by broader political and ideological currents that inform educational values, institutional trust, and curriculum. The degree of political liberalism, expressed through its support of pluralism, human rights, and institutional autonomy, affects how education is governed, what is taught, and how schools engage with families.

Inclusion is also influenced by how reforms are implemented. Poorly communicated or inconsistent reforms can provoke resistance or reframe the concept itself (Dinham, 2000). Today, the media play a crucial role in the construction of social representations. As Hodkinson (2005, 2006) has observed, newly qualified teachers in England substantially changed their views on inclusion after one year of teaching, possibly influenced by the media debate surrounding controversial public statements such as 'Inclusion has gone too far'. His interpretation has been supported by wider scholarship on the role of the media in shaping social reality (Cohen et al., 2020; De Oliveira Teixeira, 2020; Kay, 2018).

All of the contextual and structural factors mentioned above undoubtedly influence the way the concept of inclusive education is understood. This is supported by the findings of a critical conceptual analysis conducted by Göransson and Nilholm (2014), who have demonstrated that the global discourse on inclusive education reflects four qualitatively distinct categories of definitions. Moreover, there is variation not only across countries, but also within them. Kruse and Dedering (2017), for example, found different interpretations of inclusion among teachers in special and mainstream schools, and also between those working at primary versus secondary levels. Other studies have revealed professional group-specific discourses, for instance, among preschool teachers (Arhiri, 2014; Rochovská et al., 2024), primary teachers (Olsson et al., 2019), and special educators (Moberg et al., 1997).

Research Problem

The concept of inclusive education in Slovakia, as elsewhere, is shaped by ongoing collective negotiation within historical and sociopolitical contexts. As Miškolci (2016) noted, the Slovak system is still influenced by bureaucratic centralism and medicalized views of difference inherited from the Austro-Hungarian and Communist eras. This legacy is reflected in continued references to integration rather than inclusion, as well as in policies centered on diagnostic authority and categorical funding. These structural characteristics, along with neoliberal performance pressures, affect how inclusion is interpreted and enacted.

Studies using Q methodology (Sabo et al., 2018; Vančíková et al., 2021) have identified a wide spectrum of conceptualizations of inclusive schools, shaped by historical, institutional, and personal factors. What remains unclear, however, is how these conceptualizations are distributed across different groups within teacher education and which of them carry the greatest influence. Understanding this distribution is essential for designing more effective inclusion-oriented training and support strategies for pre-service teachers.

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Research Focus

Previous studies (Sabo et al., 2018; Vančíková et al., 2021) have helped identify how the concept of an inclusive school is perceived. However, less is known about the relative strength and distribution of these conceptualizations among specific actor groups. This study addresses this gap by offering an in-depth exploration of how pre-service teachers in Slovakia understand the idea of an inclusive school.

Research Aim and Research Questions

This study aimed to explore how pre-service teachers conceptualize the notion of an inclusive school. The aim was to identify the dominant ideas shaping their understanding of the term and to determine which conceptualizations resonate the most strongly. Specifically, it examined the key attributes that respondents associate with a school labeled inclusive. It assumes that variables such as professional specialization, mode of study, and personal experience with diversity may influence these subjective viewpoints. The research addressed the following questions:

RQ1: How do pre-service teachers perceive and rank different conceptualizations of an inclusive school, and which do they most and least prefer?

RQ2: Is the perception of an inclusive school influenced by teacher specialization, i.e., whether students are preparing for pre-primary, primary, or secondary education?

RQ3: Are there differences in perceptions between full- and part-time students?

RQ4: Does personal experience with diversity – specifically with children with disabilities, from socially disadvantaged backgrounds, or with giftedness – affect how pre-service teachers conceptualize inclusive education?

Research Methodology

Background

This study builds on a previous qualitative research phase that utilized Q methodology to identify eight different conceptualizations of inclusive schooling prevalent in Slovakia (Sabo et al., 2018; Vančíková et al., 2018; Vančíková et al., 2021). These initial concepts, reflecting diverse perspectives shaped by institutional, historical, and personal factors, formed the theoretical foundation for the current investigation.

To examine how strongly pre-service teachers endorse these conceptualizations and to determine their distribution across different groups, a quantitative cross-sectional survey design was employed. This research, conducted between April 2022 and February 2024, aimed to capture a snapshot of current perceptions within the Slovak teacher education landscape. The scope of the study focused on pre-service teachers across various specializations and study modes in Slovak universities, providing a broad empirical base for understanding their conceptual frameworks regarding inclusive schooling. The research approach was primarily correlational and descriptive, seeking to identify dominant conceptualizations and explore their relationship with key demographic and experiential variables. The theoretical underpinnings for interpreting these conceptualizations draw upon theories of social construction and social representation, which posit that perceptions of complex concepts, such as inclusion, are shaped by collective negotiation within socio-historical contexts, as detailed in the introduction.

The data collection instrument, a questionnaire developed within the VEGA 1/0642/20 research project, incorporated both ratings on a 6-point Likert scale and a forced choice ranking task. This approach, leveraging insights from the prior Q-methodological work, allowed for a

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systematic yet nuanced quantitative analysis of preferences, effectively bridging the qualitative generation of concepts with their quantitative validation.

Sample

The research population for this study comprised all pre-service teachers (students enrolled in teacher education programs at universities) in Slovakia. According to data from the Centre of Scientific and Technical Information of the Slovak Republic, there were 2373 teacher training students (both full-time and part-time) enrolled in Slovak universities during the data collection period.

The sample was obtained through convenience sampling, a non-probability sampling method chosen due to its practical feasibility, which is reflected in the uneven regional distribution of participants. The recruitment process involved two main steps to maximize reach:

1. Initially, official channels were utilized: Vice-Deans for Education at universities offering teacher training programs were directly contacted and asked to distribute the online questionnaire through their academic information systems to their students.

2. Due to an initially low response rate, a second step was implemented: The survey link was further distributed via student platforms on social media, with the aim of reaching a broader segment of the target population.

Ethical considerations were strictly adhered to throughout data collection. Participation was voluntary, anonymity was guaranteed by the absence of personal identifiers, and respondents were fully informed about the purpose of the research and their right to withdraw at any time without consequences.

The final sample consisted of 455 correctly completed questionnaires, representing a diverse group of bachelor and master's level students from eight Slovak universities. The average age of the respondents was 23 years. The sample composition was 88.6% full-time students and 11.4% part-time students. Regarding experience with diverse groups, most students reported no or only minimal experience with children with disabilities. This number was even slightly higher for children from socially disadvantaged backgrounds, with 80.8% of the respondents reporting little or no contact. The least contact was reported with respect to gifted children, with a total of 83% of respondents selecting one of the following responses: no experience, I perceive them only from a distance, or I have/had occasional contact in my immediate environment. Within the sample, 8 respondents reported having a disability, 3 students identified as being part of a socially disadvantaged group, and 12 identified as belonging to the group of gifted individuals.

Instrument and Procedures

To address the research questions, a quantitative survey design was employed. Data were collected using an online questionnaire designed and constructed by the authors specifically for the purposes of this study, rather than adopting a standardized instrument. In the introductory section, the respondents were informed of the aim of the research and invited to freely express their unique understanding of the topic under investigation, while anonymity was ensured.

The core of the questionnaire consisted of two parts. The first part included contextual items used to gather background information about the participants, namely: 1) age, 2) region, 3) profile of the study program (pre-primary teacher, primary education teacher, secondary education teacher), 4) current year of study, 5) mode of study (full-time/part-time), 6) experience with children with disabilities, 7) experience with children from socially disadvantaged backgrounds, and 8) experience with gifted children.

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In the second part, respondents were presented with eight different concepts of an inclusive school, to which they were asked to respond. These concepts were derived from a previous phase of the research, in which a team of researchers used Q methodology to explore how educational actors understand the concept of an "inclusive school," what attributes they associate with it, and which characteristics dominate their perceptions (Vančíková et al., 2021). The questionnaire contained shortened versions of the conceptual descriptions, as presented in Table 1. Respondents were asked to evaluate each concept in two ways: 1) using a rating on a 6-point Likert scale, where 1 indicated strong disagreement and 6 indicated strong agreement; 2) through a forced choice item, in which they were instructed to rank the eight inclusive school descriptions from the most preferred to the least preferred.

Table 1
Eight Concepts of an Inclusive School

An inclusive school is a school that…
Concept 1: …develops inclusion from the bottom up – BOTTOM-UP INCLUSION It is supported by experienced, motivated, and qualified professionals, such as teaching assistants, school psychologists, and special education teachers, on whom teachers can rely. Through effective collaboration among them, every child receives the support they need, and inclusion becomes a lived and sustainable reality, rather than something imposed from above.
Concept 2: …values every child – EVERY CHILD IS VALUED It is a high-quality school with adequate materials and human resources, where all children, without exception, are welcomed with care and respect. In such an environment, they are free to develop, express their needs, explore their potential, and take responsibility for their own learning.
Concept 3: …promotes the integration of all children – INTEGRATION AS SOCIAL MISSION It views integration as a social mission and actively seeks ways to improve its conditions in order to integrate the largest possible number of children who deviate from mainstream norms, as well as those from minority backgrounds.
Concept 4: …is responsive to the realities of the modern world – REFLECTING MODERN WORLD It perceives multiculturalism as a natural feature of contemporary society and presents students with a realistic view of life within it. It teaches tolerance and acceptance, as well as critical thinking. The school creates space for students to explore their own strengths and weaknesses, as well as the unique characteristics of others. Promotes both autonomy and responsibility.
Concept 5: …responds flexibly to current educational trends – FLEXIBLE TO TRENDS It is sensitive to developments in education and open to innovation. It actively responds to the growing demand to reduce educational inequalities and to realize the vision of social inclusion. The school participates in grant schemes and uses the available resources to enhance the individualization of education.
Concept 6: …is led by a strong, inclusion-minded leader – STRONG, INCLUSION-MINDED LEADERSHIP It is led by a leader who is capable of initiating, supporting, and motivating staff while fostering a dialogue about the direction of the school. Such a leader inspires others to embrace the idea of inclusive education and ensures that the necessary conditions for its implementation are in place.
Concept 7: ...recognizes the limits of integration – ACKNOWLEDGES LIMITS OF INTEGRATION It is open to integrating disadvantaged groups of students into mainstream education and strives to include them within its capacities. However, it acknowledges that for some children, mainstream settings may not be the most appropriate option, considering both their specific needs and the needs of their non-disabled peers.
Concept 8: ...welcomes all children of the local community – PROMOTING LOCAL INCLUSION It regards the right to education as a fundamental principle and does not select its students. Instead, it opens its doors to all children in the surrounding area, regardless of the diversity of their educational needs. It operates as a community school, maintaining close cooperation with parents, whom it sees as equal partners in the educational process.

Note. Concepts adapted from Vančíková et al. (2021).

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To ensure the validity and reliability of the data collection instrument and the integrity of the data collected, a robust process was followed. The quality of questionnaire items was initially assessed in a pilot phase with ten pre-service teachers. Their feedback on clarity, comprehensibility, and ambiguity was crucial to refine the wording of the item and confirming content and face validity.

Furthermore, to ensure the accuracy of the data from the defined target group, the questionnaire was distributed by academic officials through the university's internal systems. This targeted distribution minimized invalid responses from outside the research population, significantly contributing to the study's internal validity.

Data Analysis

Considering the ordinal nature of the data – comprising 1) ratings on a 6-point Likert scale (1 = strong disagreement, 6 = strong agreement) and 2) rankings of eight school descriptions from most to least preferred – nonparametric statistical methods appropriate for ordinal data were employed to evaluate differences in variable distributions between groups. When comparing two groups, the Mann-Whitney *U* test was applied. For comparisons involving more than two groups, the Kruskal-Wallis test was used, which extends the Mann-Whitney *U* test to multiple independent groups and evaluates whether the distributions of values differ among them. In cases where the Kruskal-Wallis test indicated statistically significant differences ($p < .05$), post-hoc pairwise comparisons were performed using Dunn's test with Bonferroni correction for multiple comparisons. While these tests do not explicitly compare medians or means, descriptive statistics, including medians with interquartile ranges (*Mdn, IQR*) and means with standard deviations (*M, SD*), were calculated for each group to provide additional context for interpreting the results. All analyses were conducted in R (version 4.1.1; R Core Team 2021).

Research Results

Overall Preferences in Inclusive School Concepts (RQ1)

To address the first research question, participants' evaluations of the eight concepts of an inclusive school were obtained using a 6-point Likert scale and forced choice rankings (see Methods). This analysis aimed to determine which conceptualizations were perceived as most and least reflective of individual perspectives on inclusion.

As an initial step, Likert scale responses were examined to provide an overview of the perceived relevance of each concept. As shown in Figure 1, the concepts were grouped into six hierarchical categories based on descriptive and inferential statistics. The top category includes *every child is valued* ($M = 5.36$, $SD = 1.04$), which was significantly more preferred than all other concepts. The second category combines *reflecting modern world* ($M = 5.19$, $SD = 1.09$) and *integration as social mission* ($M = 5.18$, $SD = 1.11$), which did not differ significantly from each other. The third category contains *bottom-up inclusion* ($M = 4.91$, $SD = 1.17$), followed by a fourth category, which groups together *acknowledges limits of integration* ($M = 4.86$, $SD = 1.29$) and *promoting local inclusion* ($M = 4.81$, $SD = 1.30$). Although these two concepts did not differ significantly from *flexible to trends* ($M = 4.78$), the latter was significantly lower than *bottom-up inclusion* and therefore forms a fifth category on its own. Finally, *strong inclusion-minded leadership* ($M = 4.68$, $SD = 1.28$) was assigned to a sixth and lowest category, being statistically distinct from the preceding group and receiving the lowest overall endorsement.

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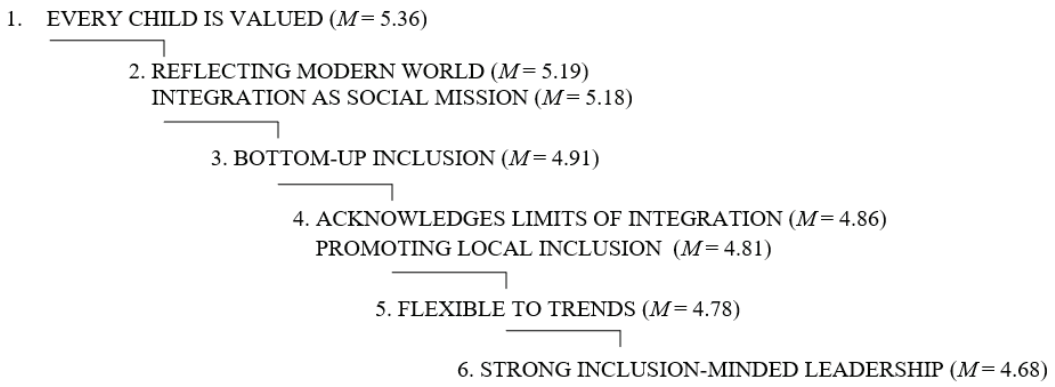
Figure 1
Ranking of Preferences among Inclusive School Concepts - Scale Ratings


1. EVERY CHILD IS VALUED (M = 5.36)
2. REFLECTING MODERN WORLD (M = 5.19)
INTEGRATION AS SOCIAL MISSION (M = 5.18)
3. BOTTOM-UP INCLUSION (M = 4.91)
4. ACKNOWLEDGES LIMITS OF INTEGRATION (M = 4.86)
PROMOTING LOCAL INCLUSION (M = 4.81)
5. FLEXIBLE TO TRENDS (M = 4.78)
6. STRONG INCLUSION-MINDED LEADERSHIP (M = 4.68)

Complementary findings were observed on the forced choice item, where participants were asked to rank the eight concepts from most to least preferred. Once again, *every child is valued* was ranked first, confirming its strong position across both measures. *Bottom-up inclusion* and *integration as social mission* consistently followed in second and third place, respectively. *Acknowledges limits of integration* and *promoting local inclusion* ranked lowest overall (Table 2). This ranking reinforces the earlier findings from the Likert scale rating: pre-service teachers are more drawn to inclusive school models that emphasize universal acceptance, student worth, and collaboration, while placing less emphasis on institutional constraints, adaptability to policy trends, or leadership structures.

Table 2
Ranking of Preferences among Inclusive School Concepts - Forced Choice Item

Concepts	Scale ratings				Forced choice item			
	M	*SD*	*Mdn*	*IQR*	*M*	*SD*	*Mdn*	*IQR*
Bottom-up inclusion	4.91	1.17	5.00	2.00	6.10	1.93	7.00	3.00
Every child is valued	5.36	1.04	6.00	1.00	7.10	1.28	7.00	1.00
Integration as social mission	5.18	1.11	6.00	1.00	5.67	1.63	6.00	2.00
Reflecting modern world	5.19	1.09	6.00	1.00	4.44	1.64	5.00	2.50
Flexible to trends	4.78	1.19	5.00	2.00	3.25	1.52	3.00	2.00
Strong, inclusion-minded leadership	4.68	1.28	5.00	2.00	3.26	1.86	3.00	2.00
Acknowledges limits of integration	4.86	1.29	5.00	2.00	3.17	1.97	2.00	3.00
Promoting local inclusion	4.81	1.30	5.00	2.00	3.10	2.10	3.00	4.00

Differences in Perceptions by Specialization Track (RQ2)

Analysis of Likert scale ratings across pre-service pre-primary, primary, and secondary teachers showed a high degree of consistency. In all three groups, the most highly rated concept was *every child is valued* (M = 5.40, SD = 0.97). Other concepts receiving average scores above 5 included *integration as social mission* and *reflecting modern world*. Among pre-service pre-primary teachers, *promoting local inclusion* also exceeded the 5-point threshold, while the

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same concept received lower scores from the other two groups. The concept rated lowest in all three groups was *strong, inclusion minded leadership* (*M* = 4.62, *SD* = 1.34). The full results are presented in Table 3.

Forced choice rankings showed the same consistent pattern: all three groups of pre-service teachers placed *every child is valued* in first place: primary (*M* = 7.15, *SD* = 1.22), secondary (*M* = 7.03, *SD* = 1.27), and pre-primary (*M* = 6.99, *SD* = 1.35). Followed by *bottom-up inclusion:* pre-primary (*M* = 6.25, *SD* = 1.81), primary (*M* = 5.98, *SD* = 2.00), secondary (*M* = 5.97, *SD* = 1.99) and *integration as social mission*: pre-primary (*M* = 5.67, *SD* = 1.72), primary (*M* = 5.67, *SD* = 1.59), secondary (*M* = 5,66, *SD* = 1.58). Although some differences appeared in concepts with lower rank, inferential analysis did not confirm statistically significant differences. These findings (Table 3) suggest a broad conceptual alignment between teacher education specializations.

Table 3

Perception Differences by Teacher Specialization Track - Scale Ratings and Forced Choice Item

Concepts	Pre-service teacher specialization	Scale ratings					Forced choice item				
		M	*SD*	*Mdn*	*IQR*	*p*	*M*	*SD*	*Mdn*	*IQR*	*p*
Bottom-up inclusion	Pre-primary	4.94	1.15	5.00	2.00	.509	6.25	1.81	7.00	3.00	.397
	Primary	4.98	1.06	5.00	1.75		5.98	2.00	6.00	3.00	
	Secondary	4.79	1.27	5.00	2.00		5.97	1.99	7.00	3.00	
Every child is valued	Pre-primary	5.38	0.93	6.00	1.00	.902	6.99	1.35	7.00	1.00	.384
	Primary	5.40	0.97	6.00	1.00		7.15	1.22	8.00	1.00	
	Secondary	5.31	1.21	6.00	1.00		7.03	1.27	7.00	1.50	
Integration as social mission	Pre-primary	5.14	1.12	5.00	1.00	.174	5.67	1.72	6.00	2.00	.919
	Primary	5.30	1.03	6.00	1.00		5.67	1.59	6.00	2.00	
	Secondary	5.10	1.15	5.00	1.00		5.66	1.58	6.00	2.00	
Reflecting modern world	Pre-primary	5.30	0.90	6.00	1.00	.747	4.50	1.65	5.00	3.00	.717
	Primary	5.20	1.03	6.00	1.00		4.34	1.61	5.00	2.00	
	Secondary	5.06	1.32	6.00	2.00		4.46	1.67	5.00	2.50	
Flexible to trends	Pre-primary	4.90	1.12	5.00	2.00	.348	3.24	1.47	3.00	2.00	.083
	Primary	4.78	1.11	5.00	2.00		3.03	1.37	3.00	2.00	
	Secondary	4.66	1.33	5.00	2.00		3.48	1.69	4.00	2.50	
Strong, inclusion-minded leadership	Pre-primary	4.73	1.27	5.00	2.00	.707	3.25	1.78	3.00	2.00	.879
	Primary	4.66	1.22	5.00	2.00		3.23	1.96	3.00	2.00	
	Secondary	4.62	1.34	5.00	2.00		3.29	1.86	3.00	2.00	
Acknowledges limits of integration	Pre-primary	4.81	1.21	5.00	2.00	.350	3.04	1.87	2.00	2.00	.808
	Primary	4.91	1.35	5.00	2.00		3.21	1.99	3.00	3.00	
	Secondary	4.86	1.33	5.00	2.00		3.26	2.08	3.00	3.50	
Promoting local inclusion	Pre-primary	5.03	1.06	5.00	2.00	.076	3.05	2.12	2.50	4.00	.111
	Primary	4.72	1.45	5.00	2.00		3.37	2.13	3.00	4.00	
	Secondary	4.64	1.36	5.00	2.00		2.89	2.02	2.00	2.00	

Differences in Perceptions by Study Mode (RQ3)

Differences between full- and part-time students were examined using both Likert scale scores and forced choice rankings. A statistically significant difference was found only in Concept 1 – *bottom-up inclusion*, which was rated higher by part-time students (*M* = 5.19, *SD* = 1.14) than by full-time students (*M* = 4.87, *SD* = 1.65; *p* = .022).

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In forced choice classification, this concept was again preferred more strongly by part-time students ($M = 6.46$, $SD = 1.96$) than by full-time students ($M = 6.02$, $SD = 1.93$; $p = .038$). In contrast, Concept 2 – *every child is valued* was more highly ranked by full-time students ($M = 7.09$, $SD = 1.27$) than by part-time students ($M = 6.81$, $SD = 1.36$; $p = .047$). No other statistically significant differences were found between the two groups. These findings suggest a slight tendency for full-time students to favor idealistic, child-centered models of inclusion, while part-time students may be more inclined toward practical, bottom-up approaches. The full results are presented in Table 4.

Table 4

Perception Differences by Study Mode - Scale Ratings and Forced Choice Item

Concepts	Study mode	Scale ratings					Forced choice item				
		M	*SD*	*Mdn*	*IQR*	*p*	*M*	*SD*	*Mdn*	*IQR*	*p*
Bottom-up inclusion	Full-time	4.87	1.65	5.00	2.00	.022	6.02	1.93	7.00	3.00	.038
	Part-time	5.19	1.14	5.00	1.00		6.46	1.96	7.00	3.00	
Every child is valued	Full-time	5.36	1.04	6.00	1.00	.998	7.09	1.27	8.00	1.00	.047
	Part-time	5.38	1.01	6.00	1.00		6.81	1.36	7.00	2.00	
Integration as social mission	Full-time	5.21	1.08	6.00	1.00	.159	5.72	1.61	6.00	2.00	.091
	Part-time	4.96	1.30	5.00	1.25		5.27	1.77	6.00	3.00	
Reflecting modern world	Full-time	5.18	1.11	6.00	1.00	.721	4.46	1.64	5.00	3.00	.496
	Part-time	5.29	0.98	5.50	1.00		4.29	1.65	5.00	2.00	
Flexible to trends	Full-time	4.78	1.19	5.00	2.00	.954	3.25	1.53	3.00	2.00	.991
	Part-time	4.81	1.16	5.00	2.00		3.21	1.45	3.00	2.00	
Strong, inclusion-minded leadership	Full-time	4.66	1.27	5.00	2.00	.285	3.23	1.83	3.00	2.00	.442
	Part-time	4.83	1.29	5.00	2.00		3.50	2.07	3.00	2.25	
Acknowledges limits of integration	Full-time	4.85	1.28	5.00	2.00	.389	3.13	1.94	2.00	2.00	.451
	Part-time	4.94	1.38	5.50	2.00		3.46	2.23	2.50	3.00	
Promoting local inclusion	Full-time	4.81	1.28	5.00	2.00	.982	3.11	2.12	3.00	4.00	.821
	Part-time	4.77	1.41	5.00	2.00		3.00	1.96	3.00	4.00	

Differences in Perceptions Based on Experience with Diversity (RQ4)

In the Likert scale ratings, most differences between groups were not statistically significant. The only exception was a marginally significant difference ($p = .043$) for Concept 4 – *reflecting modern world* in relation to experience with socially disadvantaged children. Here, respondents with no such experience rated this concept slightly higher than those with more frequent experience. However, the pattern was not robust across other concepts or domains (Table 5).

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Table 5

Perception Differences by Experience with Diversity Scale Ratings

Concepts	Experience	Children with disabilities			Children from socially disadvantaged backgrounds			Gifted children		
		M (SD)	*Mdn (IQR)*	*p*	*M (SD)*	*Mdn (IQR)*	*p*	*M (SD)*	*Mdn (IQR)*	*p*
Bottom-up inclusion	None	4.80 (1.23)	5.00 (2.00)	.462	4.99 (1.08)	5.00 (2.00)	.705	4.82 (1.20)	5.00 (2.00)	.160
	Occasional	4.96 (1.14)	5.00 (2.00)		4.86 (1.20)	5.00 (2.00)		4.96 (1.11)	5.00 (1.50)	
	Frequent	4.91 (1.13)	5.00 (2.00)		4.89 (1.22)	5.00 (2.00)		5.05 (1.16)	5.00 (1.00)	
Every child is valued	None	5.38 (0.97)	6.00 (1.00)	.859	5.50 (0.82)	6.00 (1.00)	.406	5.33 (1.06)	6.00 (1.00)	.672
	Occasional	5.35 (1.09)	6.00 (1.00)		5.32 (1.07)	6.00 (1.00)		5.39 (0.95)	6.00 (1.00)	
	Frequent	5.37 (1.00)	6.00 (1.00)		5.26 (1.23)	6.00 (1.00)		5.40 (1.13)	6.00 (1.00)	
Integration as social mission	None	5.06 (1.20)	5.00 (2.00)	.441	5.19 (1.09)	6.00 (1.00)	.937	5.17 (1.15)	6.00 (1.00)	.400
	Occasional	5.23 (1.06)	6.00 (1.00)		5.19 (1.05)	5.00 (1.00)		5.15 (1.02)	5.00 (1.00)	
	Frequent	5.23 (1.09)	6.00 (1.00)		5.14 (1.27)	6.00 (1.00)		5.27 (1.15)	6.00 (1.00)	
Reflecting modern world	None	5.24 (1.06)	6.00 (1.00)	.642	5.41 (0.84)	6.00 (1.00)	.043	5.22 (1.09)	6.00 (1.00)	.787
	Occasional	5.19 (1.14)	6.00 (1.00)		5.15 (1.11)	5.00 (1.00)		5.19 (1.05)	5.00 (1.00)	
	Frequent	5.15 (1.03)	5.00 (1.00)		4.94 (1.33)	5.50 (2.00)		5.12 (1.19)	6.00 (1.00)	
Flexible to trends	None	4.74 (1.16)	5.00 (2.00)	.504	4.91 (1.10)	5.00 (2.00)	.335	4.90 (1.19)	5.00 (2.00)	.056
	Occasional	4.83 (1.22)	5.00 (2.00)		4.77 (1.19)	5.00 (2.00)		4.70 (1.16)	5.00 (2.00)	
	Frequent	4.73 (1.17)	5.00 (2.00)		4.62 (1.32)	5.00 (2.00)		4.61 (1.23)	5.00 (2.00)	
Strong, inclusion-minded leadership	None	4.73 (1.28)	5.00 (2.00)	.761	4.68 (1.24)	5.00 (2.00)	.763	4.64 (1.30)	5.00 (2.00)	.598
	Occasional	4.63 (1.32)	5.00 (2.00)		4.71 (1.25)	5.00 (2.00)		4.78 (1.17)	5.00 (2.00)	
	Frequent	4.69 (1.15)	5.00 (2.00)		4.56 (1.39)	5.00 (2.00)		4.56 (1.40)	5.00 (2.00)	
Acknowledges limits of integration	None	4.87 (1.22)	5.00 (2.00)	.843	4.87 (1.26)	5.00 (2.00)	1.00	4.92 (1.27)	5.00 (2.00)	.199
	Occasional	4.83 (1.33)	5.00 (2.00)		4.85 (1.32)	5.00 (2.00)		4.74 (1.28)	5.00 (2.00)	
	Frequent	4.91 (1.31)	5.00 (2.00)		4.85 (1.29)	5.00 (2.00)		4.90 (1.38)	5.00 (2.00)	
Promoting local inclusion	None	4.78 (1.36)	5.00 (2.00)	.841	4.95 (1.24)	5.00 (2.00)	.264	4.91 (1.26)	5.00 (2.00)	.136
	Occasional	4.81 (1.26)	5.00 (2.00)		4.74 (1.34)	5.00 (2.00)		4.66 (1.32)	5.00 (2.00)	
	Frequent	4.84 (1.33)	5.00 (2.00)		4.75 (1.28)	5.00 (2.00)		4.78 (1.34)	5.00 (2.00)	

Note. None = no experience; only distant awareness of such children; *Occasional* = occasional contact with such children in one's immediate environment (for example, family, school, or work); *Frequent* = more frequent or direct contact in one's immediate environment, or personal identification with the group (for example, the respondent belongs to it).

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Similarly, in the forced choice rankings, no statistically significant differences were found between the experience groups for any of the eight concepts. Although some fluctuations in mean or median values were observed, particularly in Concepts 1 and 2, these did not reach the level of statistical significance (Table 6).

Table 6

Perception Differences by Experience with Diversity – Forced Choice Item

Concepts	Experience	Children with disabilities			Children from socially disadvantaged backgrounds			Gifted children		
		M (SD)	*Mdn (IQR)*	*p*	*M (SD)*	*Mdn (IQR)*	*p*	*M (SD)*	*Mdn (IQR)*	*p*
Bottom-up inclusion	None	6.18 (1.93)	7.00 (3.00)	.086	6.21 (1.92)	7.00 (3.00)	.244	6.01 (1.93)	6.00 (3.00)	.381
	Occasional	6.17 (1.88)	7.00 (3.00)		5.92 (2.00)	6.00 (3.00)		6.04 (1.93)	7.00 (3.00)	
	Frequent	5.71 (2.03)	6.00 (2.00)		6.28 (1.74)	7.00 (3.00)		6.30 (1.95)	7.00 (2.00)	
Every child is valued	None	7.07 (1.14)	7.00 (1.00)	.063	6.96 (1.31)	7.00 (2.00)	.100	7.11 (1.30)	8.00 (1.00)	.277
	Occasional	6.97 (1.35)	7.00 (2.00)		7.17 (1.22)	8.00 (1.00)		7.03 (1.34)	7.00 (1.00)	
	Frequent	7.26 (1.28)	8.00 (1.00)		6.93 (1.38)	7.00 (1.50)		6.97 (1.12)	7.00 (2.00)	
Integration as social mission	None	5.56 (1.74)	6.00 (3.00)	.725	5.62 (1.63)	6.00 (2.00)	.321	5.73 (1.58)	6.00 (2.00)	.459
	Occasional	5.70 (1.57)	6.00 (2.00)		5.75 (1.63)	6.00 (2.00)		5.66 (1.70)	6.00 (2.00)	
	Frequent	5.74 (1.65)	6.00 (2.00)		5.53 (1.66)	6.00 (3.00)		5.49 (1.67)	6.00 (3.00)	
Reflecting modern world	None	4.30 (1.67)	5.00 (2.00)	.492	4.35 (1.61)	5.00 (2.00)	.564	4.45 (1.62)	5.00 (2.75)	.953
	Occasional	4.46 (1.66)	5.00 (2.00)		4.52 (1.64)	5.00 (3.00)		4.39 (1.76)	5.00 (3.00)	
	Frequent	4.56 (1.57)	5.00 (2.50)		4.37 (1.72)	5.00 (3.00)		4.48 (1.47)	5.00 (2.00)	
Flexible to trends	None	3.31 (1.56)	3.00 (2.00)	.824	3.20 (1.47)	3.00 (2.00)	.935	3.18 (1.40)	3.00 (2.00)	.809
	Occasional	3.21 (1.52)	3.00 (2.00)		3.27 (1.53)	3.00 (2.00)		3.34 (1.65)	3.00 (2.00)	
	Frequent	3.25 (1.47)	3.00 (2.00)		3.26 (1.60)	3.00 (2.00)		3.25 (1.60)	3.00 (2.00)	
Strong, inclusion-minded leadership	None	3.34 (1.88)	3.00 (2.00)	.656	3.35 (1.95)	3.00 (2.00)	.830	3.21 (1.89)	3.00 (2.00)	.552
	Occasional	3.18 (1.82)	3.00 (2.00)		3.18 (1.80)	3.00 (2.00)		3.35 (1.80)	3.00 (2.00)	
	Frequent	3.34 (1.93)	3.00 (2.50)		3.30 (1.90)	3.00 (2.00)		3.22 (1.93)	3.00 (2.00)	
Acknowledges limits of integration	None	3.18 (1.98)	2.00 (3.00)	.876	3.19 (2.00)	2.00 (3.00)	.682	3.21 (1.96)	3.00 (3.00)	.748
	Occasional	3.20 (1.99)	3.00 (3.00)		3.10 (1.95)	2.00 (2.00)		3.05 (1.88)	2.00 (2.00)	
	Frequent	3.06 (1.95)	2.00 (2.00)		3.31 (2.00)	3.00 (3.00)		3.29 (2.21)	2.00 (3.00)	
Promoting local inclusion	None	3.06 (2.07)	2.00 (4.00)	.992	3.12 (2.17)	2.00 (4.00)	.859	3.10 (2.14)	2.50 (4.00)	.935
	Occasional	3.12 (2.15)	3.00 (4.00)		3.10 (2.03)	3.00 (4.00)		3.15 (2.11)	3.00 (4.00)	
	Frequent	3.08 (2.00)	3.00 (3.50)		3.02 (2.19)	2.00 (4.00)		3.00 (1.97)	3.00 (3.00)	

Note. None = no experience; only distant awareness of such children; *Occasional* = occasional contact with such children in one's immediate environment (for example, family, school, or work); *Frequent* = more frequent or direct contact in one's immediate environment, or personal identification with the group (for example, the respondent belongs to it).

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In general, the findings suggest that personal experience with diverse learners does not significantly shape how pre-service teachers conceptualize inclusive schooling. The preferences were largely consistent regardless of whether the students had previous contact with children with disabilities, from socially disadvantaged backgrounds, or with giftedness.

Discussion

The consistent prioritization of the concept that every child is valued by pre-service teachers in Slovakia aligned with global norms for inclusive education (Krischler et al., 2019; Savolainen et al., 2012) and emphasized respect for student diversity and equal rights (Bentley-Williams & Morgan, 2013). This principle, embedded in international declarations, reflected a sociocultural understanding of learning and a focus on equitable education beyond disability (Lalvani, 2012; Lalvani, 2013). This finding is particularly salient given Slovakia's historically strong special education tradition and ongoing shift towards more inclusive approaches (Miškolci, 2016, 2024).

Bottom-up inclusion was strongly endorsed, highlighting the role of teaching assistants and special educators whose collaborative support ensures effective inclusion. This preference reflects the importance of professional networks in inclusive practice (Bentley-Williams & Morgan, 2013; Zagona et al., 2017) and the practical need for stronger in-school support in contexts with staffing inadequacies (Simanová et al., 2024).

The notably low ranking of Strong, inclusion-minded leadership suggested that pre-service teachers in Slovakia may associate effective inclusion more with informal, relational, and internal dynamics than with formal authority. This perspective reflects the historically centralized administration in Slovakia, where key decisions on special educational needs are often made externally (Miškolci, 2016), potentially diminishing the perceived value of internal leadership. Preference for bottom-up approaches appears to compensate for limited formal authority, emphasizing reliance on practical, collaborative support, in contrast with decentralized models in countries such as Finland (Miškolci, 2016).

Significant differences in concept preferences emerged between full- and part-time students. Full-time students most favored Every child is valued, whereas part-time students emphasized Bottom-up inclusion, likely reflecting the greater professional experience and practical engagement of in-service teachers (Rumalutur & Kurniawati, 2019). This suggests that while teacher education programs cultivate inclusive ideals, experience shapes the application of inclusion in practice (Ostrowdun, 2020).

No statistically significant differences were found in conceptualizations of inclusive schooling based on prior experience with diverse children. This indicates that exposure alone may be insufficient to foster nuanced understandings of inclusion. Structured reflection and guided learning appear necessary to develop critical perspectives and social justice approaches (Bentley-Williams & Morgan, 2013; Lalvani, 2012; Zagona et al., 2017). These findings underscore the importance of teacher education programs in integrating practical experiences with critical reflection to strengthen inclusive practice.

While the study offers valuable insights, several limitations should be acknowledged. First, its cross-sectional design provides only a snapshot of pre-service teachers' conceptualizations, making it unable to capture the dynamic evolution of these perspectives over time or establish causal relationships. Second, the convenience sampling method employed, despite a two-step recruitment strategy, inherently limits the generalizability of findings to the broader Slovak pre-service teacher population, as evidenced by uneven regional representation. Third, reliance on self-reported data via an online questionnaire may introduce biases, such as social desirability, potentially influencing participants' responses regarding their conceptualizations and reported experiences with diversity. Finally, while the eight concepts of inclusive schooling

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were rigorously derived from prior Q-methodology, their presentation in a fixed-choice format inherently constrains the exploration of other uncaptured conceptualizations of inclusion. Addressing these limitations in future research through longitudinal designs, more representative sampling, and complementary qualitative methods would further enrich the understanding of how educators conceptualize inclusive education.

Conclusions and Implications

This study explored pre-service teachers' conceptualizations of inclusive schooling in Slovakia using a quantitative survey with 455 participants. Employing Likert-type scales and forced-choice rankings, the research investigated how pre-service teachers perceive and prioritize eight distinct conceptualizations. The findings consistently revealed that every child is valued as the most preferred concept, signaling a strong normative commitment to individual student worth and universal acceptance. Bottom-up inclusion, emphasizing collaborative, team-based approaches, also received significant endorsement. While full-time students prioritized the idealistic view of inclusion, part-time students showed stronger support for practical, bottom-up approaches. Notably, no statistically significant differences were found across teacher specializations or based on prior experience with diverse learners.

These findings have key implications for teacher education, emphasizing the need to bridge the gap between idealistic conceptualizations and practical implementation. Teacher preparation programs should integrate structured opportunities for critical reflection, peer dialogue, and practical application, particularly for full-time students. For part-time students, the focus should be on refining their existing practical insights with deeper theoretical frameworks. From a policy perspective, understanding these diverse conceptualizations is vital for shaping effective national strategies for inclusive education in Slovakia. Future research should investigate how these conceptualizations evolve with teaching experience and how they translate into actual pedagogical practices in diverse school settings through longitudinal studies.

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Declaration of Interest

The authors declare no competing interest.

Data availability statement

The research data supporting this study are available from the first author, Katarína Vančíková, upon reasonable request.

Ethics Statement

The Ethics Committee of Matej Bel University in Banská Bystrica approved the research (approval number: 9302024). Respondents who answered the questionnaire were informed about their research intentions using an online form.

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TEACHING SATISFACTION OF EARLY-CAREER FACULTY UNDER CHINA'S TENURE-TRACK SYSTEM: BETWEEN COMMITMENT AND CONSTRAINT

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Abstract

Escalating performance pressures and limited institutional recognition of pedagogical contributions have become pressing challenges for early-career faculty in transitional higher education systems, particularly under China's tenure-track system (TTS). Research in predominantly Western contexts has largely prioritised research productivity, leaving teaching-related outcomes in performance-driven non-Western settings underexplored. Integrating the Job Demands–Resources (JD-R) model and Self-Determination Theory (SDT), this study employed a mixed-methods design, combining survey data from 116 early-career faculty and in-depth interviews with six participants at a research-intensive Chinese university. Quantitative results revealed moderate overall satisfaction, with significant disparities across academic ranks and disciplines, while qualitative findings highlighted persistent barriers such as excessive workload, limited autonomy, and low institutional recognition. Autonomy emerged as a nuanced factor, with constrained decision-making authority diminishing satisfaction despite partial fulfilment of relatedness and competence needs. Extending the integrated JD-R–SDT framework to a transitional higher education context, the analysis offers policy-relevant directions for embedding teaching quality into evaluation systems, recalibrating workload allocations, and strengthening peer support, with insights transferable to performance-driven TTS in countries including Japan, South Korea, and other emerging systems in Asia and beyond.

Keywords: *tenure-track system, early-career faculty, teaching satisfaction, mixed-methods research, higher education policy*

Introduction

In recent decades, the growing emphasis on research productivity in global higher education has reshaped the definition of faculty roles, often relegating teaching responsibilities to the periphery. This trend is particularly visible in performance-based appointment systems, where measurable research outputs dominate promotion criteria. While such systems aim to enhance institutional competitiveness, they frequently generate tensions between faculty members' research and teaching responsibilities. These dynamics are not confined to a single national context. Many countries, including the United States, Japan, and South Korea, have adopted tenure-track systems (TTS) to attract academic talent and strengthen competitiveness (Peng & Hu, 2023; Wang & Li, 2023). In China, the TTS typically require early-career faculty to attain promotion within a fixed probationary period (often six years) or face termination. This practice is often referred to as China's version of the "up-or-out" policy (Liu & Wang, 2020; Wang & Li, 2023). To reduce uncertainty in recruitment and advancement, institutions have implemented rigid, publication-based evaluation systems, with clear benchmarks for high-impact journal output (Zhang & Wang, 2020). As a result, academic work is increasingly shaped by a publish-or-perish culture. However, while the research implications of such systems are

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well documented, their impact on teaching satisfaction remains underexplored, especially in non-Western and transitional higher education contexts where policy reforms interact with entrenched cultural norms.

China's TTS shares structural similarities with the "up-or-out" models in the United States and South Korea, but imposes more rigid, publication-centred performance benchmarks, making it a particularly revealing case for examining the tensions between research and teaching. China's TTS reflects broader shifts toward performance-based academic systems but shows distinctive rigidity. In Japan, dual-track arrangements, and in South Korea, mechanisms incorporating student feedback illustrate more adaptive ways to recognize multiple dimensions of academic work. Evidence from Japan suggests that fixed-term faculty report higher fatigue than tenure-track peers (Kim et al., 2024). In South Korea, disciplinary disparities in advancement persist, with social-science postdoctoral fellows transitioning more readily than those in the humanities (Jung et al., 2023). In North America and Europe, teaching portfolios and peer evaluations are increasingly included in tenure reviews (Fairweather, 2002; Mäntysaari, 2022), yet research metrics continue to outweigh teaching achievements. Against this backdrop, this study focuses on China's TTS to examine how performance-based regimes shape teaching satisfaction among early-career faculty.

Research Problem

Higher education institutions worldwide expect faculty to balance the "Big Three" responsibilities–teaching, research, and service. However, research continues to receive disproportionate emphasis in institutional evaluation systems (Love et al., 2022). Pedagogical contributions are rarely included in performance appraisals (Crutchley et al., 2024; Geng & Lou, 2022), and tenure decisions often hinge on research metrics, particularly publications in journals indexed by Arts and Humanities Citation Index (AHCI), Science Citation Index (SCI), Social Sciences Citation Index (SSCI), or Chinese Social Sciences Citation Index (CSSCI) (Tumulty, 2024; Xu & Solanki, 2020; Zhang & Wang, 2020). This structural bias marginalises teaching, particularly in institutions where academic prestige is closely tied to quantitative research output, leading early-career faculty to prioritise research over teaching quality (Wang, 2022).

Compared to traditional contracts, tenure-track positions offer higher salaries and clearer advancement pathways but impose more stringent evaluation demands (Hashmi et al., 2024). The divergence between rhetorical emphasis on teaching excellence and material rewards for research leads to mounting role conflict and motivational strain (Barat & Harvey, 2015; Wolverton, 1998). Faculty who excel in research often do so at the cost of diminished teaching involvement, elevated stress, and deteriorating well-being (Liu et al., 2021; Zhang, 2024). Publication output tends to peak during the pre-tenure period, which coincides with declining engagement in teaching, especially in non-laboratory disciplines (Tripodi et al., 2025). Inconsistent tenure standards across departments exacerbate professional insecurity (Liu & Song, 2023; Niloofar et al., 2020), while caregiving responsibilities, gendered expectations, and institutional bias intensify marginalisation and identity conflict experienced by female faculty members (Hellsten et al., 2011).

Previous studies link teaching satisfaction to organisational climate, development opportunities, and incentive programmes (Gosling et al., 2020; Trower & Gallagher, 2010), as well as to workload, class sizes, infrastructure, and instructional support (Tian et al., 2020). In such environments, relational factors that include collegial recognition and student engagement become important mediators of satisfaction (Dinamling & Depaynos, 2024; Rahmawati et al., 2023). While elements such as institutional support, intrinsic motivation, and teaching identity are known to influence teaching satisfaction (Sumanasena & Nawastheen, 2022), these factors

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remain underdeveloped in many TTS environments. In transitional systems like China, reforms often unfold without adequate teaching support, forcing faculty to make challenging trade-offs while working with limited resources (Wang & Pang, 2022).

This gap is especially salient in Global South higher education, where neoliberal reforms intersect with Confucian academic traditions and entrenched performance hierarchies. Prior literature tends to treat structural factors (e.g., policy, workload) and psychological dimensions (e.g., motivation, identity) in isolation, overlooking their interaction. Without addressing this disjunction, TTS reforms risk reinforcing the very disparities they were designed to overcome.

Theoretical Framework

This study employs two complementary theoretical frameworks, Self-Determination Theory (SDT) and the Job Demands–Resources (JD-R) model, to examine the interaction between individual motivation and institutional constraints in influencing teaching satisfaction among early-career faculty. The JD-R model (Bakker & Demerouti, 2018) posits that employee well-being and performance are shaped by the dynamic balance between job demands, such as workload, time pressure and job insecurity, and job resources, such as autonomy, support and developmental opportunities. If employees are faced with demands that exceed the resources available to them, it is likely that they will experience disengagement and emotional exhaustion (Hossan et al., 2023; Ko, 2022). By contrast, SDT emphasises that internal psychological needs are what drive motivation. Ryan and Deci (2024) argue that three fundamental needs, autonomy, competence, and relatedness, must be met for individuals to maintain intrinsic motivation and long-term commitment. When these needs are thwarted, even in the presence of external rewards, motivation tends to decline (Crick et al., 2020; Manninen et al., 2022; Ryan & Deci, 2024).

While the JD-R model focuses primarily on the structural balance between job demands and institutional resources, the SDT model addresses internal psychological mechanisms. In this study, JD-R accounts for institutional workload and recognition gaps, whereas SDT highlights how such structural constraints frustrate faculty autonomy, competence, and relatedness. Together, JD-R and SDT provide a dual-pathway lens through which teaching satisfaction can be understood. The JD-R framework helps identify how structural aspects of TTS, including publication quotas, limited pedagogical support, and standardized evaluations, contribute to pressure and decreased institutional support. Simultaneously, SDT explains how these same structural features erode faculty members' autonomy in course design, competence in teaching, and relatedness within their academic communities. This integrated approach enables a more holistic analysis of how faculty experience teaching under policy-driven constraints.

Integrating JD-R and SDT offers a dual-pathway lens for understanding teaching satisfaction in performance-driven academic contexts. This approach is particularly relevant in the Chinese TTS, where high demands and uneven support necessitate examining how external constraints and internal motivations interact to shape faculty experiences. Figure 1 maps how specific TTS policies translate into job demands and resources (JD-R) and how these, in turn, influence psychological need fulfilment or frustration (SDT). This integrated model not only guides the analysis but also provides a transferable framework for similar contexts in other transitional higher education systems (van den Broeck et al., 2010).

This study further proposes that job resources and psychological needs interact reciprocally: resource scarcity not only directly reduces teaching satisfaction through structural constraints (JD-R) but also indirectly undermines it by frustrating autonomy, competence, and relatedness (SDT). This compounded erosion effect suggests that interventions addressing structural resources without attending to psychological needs may be insufficient. Conversely, enhancing psychological fulfilment without mitigating excessive job demands may have a limited impact on sustaining teaching engagement.

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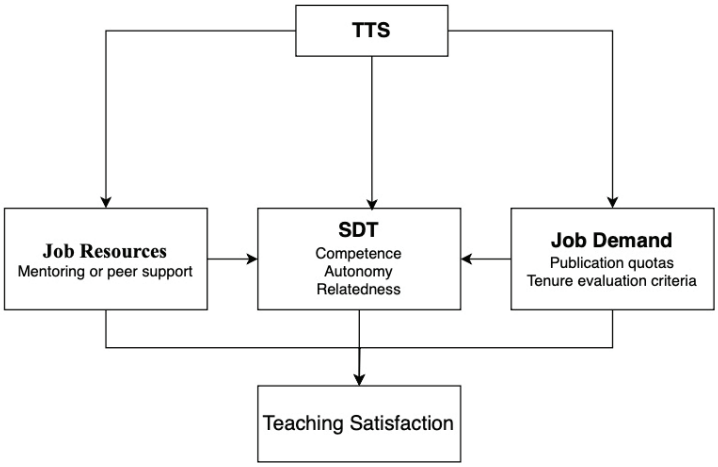
Figure 1
Conceptual Model



Note. The figure illustrates how TTS policies influence faculty teaching satisfaction through two parallel pathways: structural job demands and institutional resources (JD-R), and the satisfaction or frustration of basic psychological needs (SDT). Mentoring enhances job resources and supports relatedness, while publication and evaluation pressures increase job demands, undermining competence and autonomy.

Research Aim and Research Questions

This study examines how institutional constraints and psychological needs jointly influence teaching satisfaction among early-career faculty working under China's TTS. Drawing on the integrated JD-R and SDT frameworks, the research explores both structural pressures and motivational dynamics that shape faculty engagement with teaching. Specifically, it aims to address the following research questions (RQs):

1. What is the overall level of teaching satisfaction among early-career faculty under China's tenure-track system?
2. How does teaching satisfaction vary across key dimensions such as workload, institutional support, and teaching identity?
3. How do early-career faculty members interpret and contextualize their experiences of teaching satisfaction or dissatisfaction within the broader institutional and cultural landscape?

By answering these questions, the study contributes to the global literature on faculty development, offering both theoretical insights and policy recommendations for improving teaching satisfaction in performance-oriented academic environments.

Research Methodology

Design

This study, grounded in the JD-R model and SDT, adopted a mixed-methods design (Creswell & Creswell, 2018) to examine teaching satisfaction among early-career faculty under China's TTS. Data were collected in two sequential phases between January and March 2025. Phase 1 involved a structured online survey, while Phase 2 comprised semi-structured interviews with a sub-sample of survey respondents. The rationale for this design was twofold: (1) quantitative findings could reveal broad satisfaction patterns and key predictors, and (2)

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qualitative insights could contextualise these patterns, offering nuanced explanations for statistical trends. This integration of methods enhances both internal validity and contextual depth, making the approach transferable to studies of academic work in other transitional higher education systems.

Participants and Sampling

The quantitative phase employed a census-based sampling strategy targeting all full-time early-career faculty (fewer than six years of service) under TTS at a leading research-intensive university in eastern China, referred to here as University C. University C was selected because it is a representative "Double First-Class" research-intensive university. It exemplifies the core characteristics of China's TTS, including high publication benchmarks, competitive tenure timelines, and pronounced research-teaching tensions. The diversity of disciplines, gender balance, and rank composition within the sample broadly mirrors national patterns for early-career faculty in comparable institutions, enhancing the transferability of findings despite the single-site design.

Institutional records indicated approximately 430 eligible faculty members. An invitation containing the survey link and informed consent form was distributed via internal email and yielded 116 valid responses (response rate = 27%). This rate is consistent with standards for voluntary surveys in high-pressure academic contexts. Participants represented diverse backgrounds: 30.2% were from Science, Technology, Engineering, and Mathematics (STEM), 69.8% from the humanities and social sciences (HSS); gender distribution was 51.7% male and 48.3% female. Most respondents (92.2%) held assistant professor positions, and the majority were aged between 31 and 34 years.

Table 1
Demographic Characteristics of the Sample

Category	Subcategory	Percentage
Gender	Male	51.7
	Female	48.3
Age	<=30	32.8
	31-34	58.6
	>=35	8.6
Years of Service	1-2 years	33.6
	3-4 years	31.9
	5-6 years	34.5
Academic Title	Assistant Professor	92.2
	Associate Professor	7.8
Discipline	STEM	30.2
	HSS	69.8

Note. Percentages (%) are calculated based on the total sample size (N = 116).

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In the qualitative phase, purposeful sampling was used to select six interviewees from the survey pool, based on maximum variation in (1) discipline, (2) gender, (3) age group, and (4) self-reported teaching satisfaction. This approach enhanced diversity and ensured multiple perspectives. Sampling continued until thematic saturation was reached after the fifth interview, with one additional interview conducted for confirmation. Table 2 provides a profile of the six interviewees. For added transparency, Table 3 presents an example of the coding process, showing the evolution from raw quotes to initial codes and final themes.

Table 2
Demographic and Professional Profiles of Interview Participants

Pseudonym	Age	Academic Title	Discipline
H1	34	Assistant Professor	Philosophy (HSS)
H2	31	Associate Professor	Literature (HSS)
H3	29	Assistant Professor	History (HSS)
S1	30	Assistant Professor	Mechanical Engineering (STEM)
S2	32	Assistant Professor	Chemical Engineering (STEM)
S3	28	Assistant Professor	Physics (STEM)

Table 3
Coding Process Example

Raw Data Excerpt (Interview Quote)	Initial Code	Sub-theme	Overarching Theme
"Limited access to laboratories and specialised equipment frequently compromises the quality of practical teaching." (S1)	Lack of laboratory access; Inadequate teaching equipment	Resource constraints in STEM	Structural and resource constraints
"Even if teaching is not institutionally valued, it remains personally important. Seeing students grasp complex concepts is a reward in itself." (S2)	Personal value of teaching; Student learning as motivation	Intrinsic teaching motivation	Teaching identity and intrinsic motivation
"Positive student feedback and teaching achievements are rarely translated into tangible rewards or advancement." (H2)	Lack of recognition for teaching; Promotion criteria favour research	Institutional devaluation of teaching	Institutional valuation of teaching
"Teaching-related tasks are often delayed due to long administrative chains, leaving little room for reflection or improvement." (H1)	Bureaucratic delays; Administrative overload	Procedural inefficiencies	Structural and resource constraints

Data Collection

The survey instrument was adapted from the Faculty Satisfaction Questionnaire developed by Gil (1991) and translated into Chinese. An expert panel of three education scholars reviewed

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the translation for clarity, cultural fit, and construct coverage. Psychometric properties were tested using SPSS. The 11-item scale showed high internal consistency (Cronbach's α = .853). Exploratory factor analysis indicated good construct validity (KMO = .816; Bartlett's test: χ^2 = 553.476, *df* = 55, $p < .001$), revealing three latent factors that collectively explained 66.77% of the total variance. These results confirmed the instrument's reliability and validity for assessing faculty teaching satisfaction in the Chinese context.

Semi-structured interviews were conducted either face-to-face or via encrypted video conferencing platforms, depending on participants' availability. The interview protocol explored the following themes:

1. Faculty perceptions of the TTS and its implications for teaching responsibilities;
2. Sources of satisfaction and dissatisfaction in teaching;
3. Experiences with institutional support, mentoring, and workload;
4. Suggestions for enhancing teaching support and recognition.

Each interview lasted 30–60 minutes, was audio-recorded with participant consent, and transcribed verbatim. Maximum variation sampling was operationalised by stratifying the pool along the four criteria listed above. This strategy enhanced the representativeness of qualitative insights.

Data Analysis

Descriptive statistics (e.g., means, frequencies) were used to summarise demographics and satisfaction levels. Inferential analyses–including t-tests, one-way ANOVA, and multiple linear regression–examined associations between satisfaction and variables such as gender, discipline, rank, and tenure. Statistical significance was set at $p < .05$.

Interview transcripts were analysed using Braun and Clarke's (2006) six-phase thematic analysis: familiarisation, coding, theme generation, review, definition, and reporting. NVivo 12 supports data management and coding. In line with the convergent parallel design, quantitative and qualitative results were interpreted jointly. Converging findings were used to triangulate conclusions, while divergent results were explored for contextual explanations.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board of University C. All participants provided informed consent and were assured of confidentiality, voluntary participation, and the right to withdraw at any stage. All data were anonymised and securely stored and used exclusively for academic research purposes.

Research Results

Overall Teaching Satisfaction

Quantitative analyses indicated that overall teaching satisfaction among early-career faculty was moderate ($M = 3.12$, $SD = 0.68$; 5-point scale). A multiple linear regression was conducted to examine the predictive effects of demographic and professional characteristics on teaching satisfaction (T_Mean). The model included five predictors: gender, age, career tenure, academic title, and disciplinary affiliation, selected based on prior research and preliminary correlations.

The model was statistically significant, F (5, 110) = 2.638, $p = .027$, explaining 10.7% of the variance in teaching satisfaction ($R^2 = .107$, Adjusted $R^2 = .066$), which is within the expected range for attitudinal research in social sciences where multiple contextual factors

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remain unmeasured. As shown in Table 4, academic title (B = .414, p = .031) and disciplinary affiliation (B = –.233, p = .039) were significant predictors.

Faculty with higher academic ranks reported greater satisfaction, whereas STEM faculty reported lower satisfaction than those in the HSS. Standardized coefficients showed that academic title had a moderate effect (β = .198), while disciplinary affiliation had a smaller, negative effect (β = –.191).

These findings support the JD-R model's proposition that job satisfaction emerges from the interplay between individual resources and structural demands. Despite intrinsic motivation, structural inequalities in institutional support across disciplines and ranks significantly shape teaching satisfaction.

Table 4

Multiple Linear Regression Predicting Teaching Satisfaction (T_Mean)

Predictor	*B*	*SE*	*β*	*t*	*p*
(Constant)	2.670	0.361	—	7.393	<.001
Gender	0.058	0.103	0.051	0.558	.578
Age	0.141	0.086	0.150	1.650	.102
Career Tenure	0.031	0.061	0.045	0.499	.619
Academic Title	**0.414**	**0.190**	**0.198**	**2.183**	**.031**
Discipline	**–0.233**	**0.111**	**–0.191**	**–2.094**	**.039**

Note. Dependent variable: Teaching Satisfaction (T_Mean); R^2 = .107, Adjusted R^2 = .066, $F(5, 110) = 2.638$, p = .027.

Teaching Satisfaction Across Key Dimensions

Table 5 maps the 11 teaching satisfaction items based on the JD-R model and SDT, accompanied by descriptive statistics. Variation across items reflects the multidimensional character of early-career faculty members' teaching experiences.

The highest satisfaction was reported for T1: Teaching as a Professional Career (M = 3.78, SD = 0.99), indicating strong professional identification and intrinsic motivation. The lowest scores were for T8: Specialized Teaching Facilities (M = 2.67, SD = 0.76), T9: Class Size (M = 2.75, SD = 0.70), and T10: Teaching Workload (M = 2.85, SD = 0.94), signalling resource scarcity and workload intensification—key job demands in the JD-R model. Moderate scores for T3: Academic Freedom in Course Design (M = 3.34, SD = 0.90) and T6: Departmental Teaching Methods (M = 3.01, SD = 0.79) suggest partial autonomy and inconsistent collegial support. T11: Institutional Teaching Rewards (M = 3.21, SD = 1.08) reflected ambivalence toward institutional recognition.

Overall, the tension between internal professional commitment and externally imposed constraints underscores the role of resource adequacy, autonomy, and recognition in shaping satisfaction, as highlighted in both the JD-R and SDT frameworks.

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Table 5
Mapping of Teaching Satisfaction Items to JD-R and SDT Dimensions with Descriptive Statistics

Item No.	Item Content (Abbreviated)	JD-R Category	SDT Need	*M*	*SD*
T1	Teaching as a professional career	-	Competence	3.78	0.994
T2	Teaching in the classroom	-	Competence	3.35	0.971
T3	Academic freedom in course design	Job Resource	Autonomy	3.34	0.904
T4	Constructing examinations	Job Resource	Autonomy	3.27	0.878
T5	Evaluation procedures appropriateness	Job Resource	Competence	2.95	0.893
T6	Departmental teaching methods	Job Resource	Relatedness	3.01	0.786
T7	Advising of students	Job Demand	Relatedness	3.09	0.746
T8	Specialized teaching facilities	Job Resource	-	2.67	0.755
T9	Class size	Job Demand	-	2.75	0.696
T10	Teaching workload	Job Demand	-	2.85	0.944
T11	Institutional teaching rewards	Job Resource	Relatedness	3.21	1.084

Note. Scale: 1 = very dissatisfied; 5 = very satisfied.

Qualitative Insights into Teaching Satisfaction

Although the interview protocol explored four major areas–faculty perceptions of the TTS, sources of teaching satisfaction and dissatisfaction, experiences with institutional support and workload, and suggestions for improving teaching recognition–thematic analysis identified three overarching themes: (1) institutional valuation of teaching, (2) structural and resource constraints, and (3) teaching identity and intrinsic motivation. These findings address RQ2 and RQ3 by illustrating lived experiences and meaning-making processes.

Institutional Valuation of Teaching

The perceived devaluation of teaching in institutional reward systems was a recurrent theme in both the survey data and the qualitative interviews. Although early-career faculty demonstrated strong intrinsic motivation and teaching identity around teaching, they consistently reported that teaching excellence had little bearing on career progression.

All six interviewees emphasised that research output remains the primary metric for promotion, with teaching contributions often ignored regardless of quality or student impact. H1 noted, "Despite the rhetoric of 'teaching excellence,' actual career progression depends overwhelmingly on publication records." H2 stated, "Positive student feedback and teaching achievements are rarely translated into tangible rewards or advancement." H3 remarked, "Tenure applications require SSCI papers, but there's no formal credit for teaching awards or student evaluations." STEM faculty expressed similar sentiments. S2 shared, "Although I am passionate about teaching, colleagues and mentors advise me to focus on publications to get tenure." S3 described teaching as "a necessary obligation rather than a valued role." S1 explained, "There are no bonuses or awards for teaching–so naturally, people shift their energy to research."

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These views help contextualise the survey result that institutional teaching rewards (T11) received only a neutral mean score ($M = 3.21$), despite teaching being perceived as a core aspect of faculty identity. The regression analysis also indicated that academic title significantly predicted satisfaction, suggesting that only those in higher ranks may be able to reconcile teaching contributions with institutional expectations, while junior faculty are left unsupported. This misalignment reflects a systemic disincentive for early-career faculty to invest in teaching beyond minimum requirements. The institutional reward structure prioritises research at the expense of pedagogy, creating what JD-R theory identifies as a resource asymmetry and what SDT describes as frustration of competence and relatedness needs.

Professional Commitment and Teaching Identity

Despite the structural pressures, all interviewees expressed a strong teaching identity and intrinsic motivation. Teaching was described as a meaningful responsibility deeply connected to students' intellectual development. For example, H1 stated, "Teaching goes beyond administrative obligations—it's about contributing to students' growth," while H2 noted, "Student progress is the most rewarding aspect of my work." H3 added, "Teaching helps me find meaning in academia."

STEM faculty echoed these sentiments despite resource constraints. S1 remarked, "Though resources are limited, I enjoy teaching and try to adapt." S2 observed, "Even if teaching is not institutionally valued, it remains personally important." S3 emphasised, "The joy of witnessing students' growth is irreplaceable." These narratives reinforce the survey finding that T1 scored highest, highlighting intrinsic motivation as central to faculty work, consistent with SDT.

Structural and Resource Constraints

Despite their strong professional commitment, all six participants identified structural and resource-related constraints that negatively impacted their teaching satisfaction. These concerns were consistent with the lowest-rated items in the survey (see Table 5, T8–T10). Faculty across both disciplinary groups described how limited infrastructure and excessive responsibilities compromised the quality of instruction and their professional well-being. For example, STEM faculty highlighted tangible deficiencies, while HSS faculty pointed to administrative and symbolic barriers.

STEM faculty, particularly S1, S2, and S3, emphasized persistent shortages of laboratory space, instructional equipment, and technical assistance. S1 explained, "Limited access to laboratories and specialised equipment frequently compromises the quality of practical teaching. This not only affects student learning outcomes but also increases faculty workload due to the need for constant improvisation. S2 described managing "three large classes per semester," severely restricting his ability to provide personalized feedback. S3 noted that "there is barely enough infrastructure to support teaching requirements, yet expectations remain high—it's unsustainable."

HSS faculty reported parallel frustrations, though focused more on institutional support and administrative burden. H3 stated, "The increasing workload, without corresponding administrative support or recognition, leads to chronic exhaustion and limits pedagogical innovation." H1 remarked, "Teaching-related tasks are often delayed due to long administrative chains, leaving little room for reflection or improvement." H2 noted, "While I'm committed to teaching, there's no dedicated support–no assistant, no course design aid–everything is self-managed."

These qualitative accounts enrich and contextualize the regression finding that disciplinary affiliation was a significant predictor of teaching satisfaction ($B = –.233$, p

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= .039; see Table 4), with STEM faculty reporting lower satisfaction than their humanities counterparts. While the quantitative model explained only 10.7% of the variance in satisfaction, the interview data help illuminate the mechanisms underlying these differences. STEM faculty experience structural challenges that are material in nature, including infrastructural deficits and high student-teacher ratios, while humanities faculty face symbolic exclusion, including a lack of recognition and persistent bureaucratic inefficiencies. STEM faculty often adopted practical coping strategies in response to institutional pressures, such as streamlining feedback, simplifying assessments, or standardizing instruction. In contrast, academics in the humanities generally resisted these demands in theory, often devoting more time to teaching in spite of the lack of institutional support. According to H3, this resistance manifested as "quietly pushing back" against publication expectations by spending more time preparing for classes, which was seen as a sign of professional autonomy.

Collectively, these trends show how structural and relational demands that are unequally distributed across disciplines can impede faculty members' psychological needs for autonomy, competence, and social connection. This observation is supported by the JD-R model and SDT, which both emphasize the interplay between internal motivations and external constraints. Therefore, to increase early-career faculty members' satisfaction, institutional initiatives that recognize the disciplinary contexts in which they work are required. In order to address disparities in workload, infrastructure, and recognition, such reforms must address both the tangible and intangible aspects of academic life.

Synthesis of Quantitative and Qualitative Findings

Integrating both datasets provides a richer explanation than either method alone. While the regression model explained only 10.7% of the variance, interviews illuminated unmeasured factors such as disciplinary workload norms, informal mentoring, and departmental decision-making styles. The evidence shows that structural constraints (JD-R) and psychological needs (SDT) jointly shape satisfaction, suggesting reforms that address both tangible resources and intangible recognition. These dynamics are likely to resonate in other performance-driven systems, extending the applicability of the dual-pathway framework beyond China's TTS.

Discussion

This discussion addresses three dimensions: disciplinary disparities, motivational tensions, and systemic evaluation mechanisms. These are interpreted through the JD-R and SDT frameworks. Rather than restating statistical details, this section focuses on interpreting the mechanisms behind the observed patterns and their broader theoretical and policy implications. Before interpreting the substantive findings, it is important to note that the explanatory power of the regression model (R^2 = .107) is relatively modest. This is not uncommon in social science research on attitudinal and behavioural outcomes, which are influenced by numerous unmeasured interpersonal and contextual variables. In this study, qualitative evidence captured several of these unobserved determinants–such as departmental culture, mentoring practices, and collegial support–providing richer explanatory depth than the quantitative model alone could achieve. This mixed-methods design thus allows for a more comprehensive interpretation of teaching satisfaction within the Chinese TTS context.

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Teaching Satisfaction Is Moderate and Varies by Academic Title and Discipline

Findings reveal that teaching satisfaction is unevenly distributed across academic ranks and disciplines, reflecting entrenched structural inequities in China's TTS. Senior faculty enjoy more institutional resources and informal privileges, while early-career STEM academics face persistent infrastructural shortages and heavier workloads. These disparities suggest that satisfaction is not merely an outcome of personal motivation but is structurally produced through the uneven allocation of resources and opportunities. This dynamic aligns with the JD-R model's emphasis on the balance between demands and resources. It also aligns with concerns raised by Liu et al. (2021) and Wang and Li (2023) that China's TTS favours research over teaching, particularly disadvantaging faculty in STEM. While enthusiasm for teaching persists among early-career faculty, it is increasingly constrained by systemic neglect of teaching. This pattern is consistent with the resource asymmetries identified in Peng and Hu (2023). The limited explanatory power of the regression model ($R^2 = .107$) further suggests that unmeasured factors such as departmental leadership, collegial collaboration, and academic community membership, as highlighted in Gosling et al. (2020), likely play critical roles in shaping satisfaction.

Structural Constraints Undermine Satisfaction Despite Strong Teaching Identity

While faculty expressed a strong teaching identity (T1: $M = 3.78$), satisfaction declined sharply in areas like workload (T10: $M = 2.85$), resources (T8: $M = 2.67$), and class size (T9: $M = 2.75$). These patterns echo broader trends in Asian higher education (Sumanasena & Nawastheen, 2022; Tian et al., 2020). From a JD-R perspective, such persistent demands erode engagement when they exceed the resources available to meet them. SDT further explains that even highly motivated faculty lose energy when their core needs–autonomy, competence, and relatedness–are repeatedly thwarted (Ryan & Deci, 2024). Internal values alone cannot sustain engagement when institutional environments remain unsupportive (Crick et al., 2020). In this context, resilience should not be interpreted as evidence of institutional effectiveness but rather as an indicator of individual coping within an unsupportive environment. These material and symbolic constraints are closely intertwined, as resource shortages are often compounded by institutional undervaluation of teaching efforts.

Institutional Devaluation of Teaching Limits Recognition and Advancement

Interviews consistently indicated a "recognition gap" between rhetorical affirmation of teaching and material rewards, echoing critiques by Barat and Harvey (2015) and Tumulty (2024). While research output remains the dominant criterion for promotion, teaching contributions are consistently treated as symbolic rather than material, regardless of quality. Faculty responses varied: STEM faculty often standardize instruction to manage demands, whereas humanities faculty frame teaching as a form of moral resistance. This discrepancy between professional dedication and institutional recognition mirrors the structural tensions highlighted by Love et al. (2022). Within the JD-R framework, this gap reduces access to key institutional resources; from an SDT perspective, it frustrates relatedness and competence needs, thereby eroding intrinsic motivation. Persistence in teaching should therefore be interpreted not as evidence of resilience but as an adaptive response to systemic misalignment between motivation and support.

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Theoretical Synthesis and Contribution to the Literature

This study demonstrates how JD-R and SDT jointly explain the interplay of structural constraints and intrinsic motivation. Beyond parallel application, this study integrates JD-R and SDT into a composite explanatory framework. Resource asymmetries in the Chinese TTS context operate as dual stressors: structurally, they increase job demands and reduce institutional resources (JD-R); psychologically, they frustrate core needs (SDT), amplifying dissatisfaction through both direct and indirect pathways. This dual-mechanism explanation extends the predictive capacity of both models and offers a transferable analytical lens for similar performance-driven systems. In China, credentialism and academic massification reinforce a symbolic hierarchy privileging research over teaching, reflecting broader patterns of academic capitalism (Hellsten et al., 2011; Love et al., 2022).

By integrating sociocultural analysis into JD-R and SDT, this study offers a transferable framework for analysing teaching satisfaction in other transitional and performance-driven systems. These findings collectively address the three research questions by quantifying satisfaction levels (RQ1), identifying key dimensions and disparities (RQ2), and contextualising faculty perceptions within institutional and cultural settings (RQ3).

Limitations and Future Directions

While the findings provide valuable insights, certain design and scope constraints limit their generalisability. First, the single-site design and relatively small sample size (N = 116 for the survey; N = 6 for interviews) may restrict applicability to other institutional contexts. Although thematic saturation was achieved, caution is warranted in extrapolating the results. Future studies could adopt multi-institutional or longitudinal designs to capture broader patterns and track changes over time.

Second, the low explanatory power of the regression model (R^2 = .107) suggests that key determinants of teaching satisfaction were not captured. Relational and organizational factors–such as departmental leadership style, peer mentoring, student engagement, perceptions of collegiality, and participation in academic communities–may play a critical mediating role. Incorporating these variables into future models could yield a more comprehensive understanding of how structural and interpersonal dynamics jointly shape satisfaction.

Finally, future research should also examine how dissatisfaction with institutional support structures affects not only faculty well-being but also classroom practices and student learning outcomes. Mixed-methods and longitudinal approaches would be particularly well suited to tracing the evolving experiences of early-career faculty as they navigate the demands and uncertainties of the TTS.

Conclusions and Implications

This study identified a clear gap between early-career faculty members' intrinsic motivation for teaching and their actual satisfaction levels under China's TTS. Structural constraints–including excessive workload, limited autonomy, and insufficient recognition–emerged as critical barriers to sustained engagement. Quantitative results revealed moderate overall satisfaction, with significant disparities by academic title and discipline, while qualitative insights illuminated how institutional demands undermine autonomy, competence, and relatedness. By integrating the JD-R model and SDT, this study developed a dual-pathway framework that explains how structural pressures and unmet psychological needs jointly erode teaching satisfaction. The framework advances JD-R by identifying discipline-specific resource asymmetries as a core determinant of satisfaction and extends SDT by contextualising need frustration within performance-based academic cultures. These contributions broaden the theoretical utility of both models in non-Western and transitional higher education systems.

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Institutions should recalibrate performance metrics to incorporate robust indicators of teaching quality–such as peer evaluations, student learning outcomes, and teaching portfolios–into promotion and tenure criteria. This recalibration must be discipline-sensitive, recognising that STEM and HSS fields face distinct infrastructural and pedagogical demands. Workload allocation models need to be adjusted accordingly, ensuring that resource-intensive fields receive adequate infrastructure and manageable class sizes. Fostering peer support systems through mentoring and collaborative teaching initiatives can strengthen faculty relatedness and resilience. Beyond China, these findings offer transferable lessons for other performance-driven systems, such as South Korea, Japan, and emerging systems in Southeast Asia, where research dominance risks marginalising teaching. The dual-pathway model provides a diagnostic tool for identifying where job demands outstrip resources and where psychological needs are systematically frustrated, guiding both policy and institutional interventions.

Declaration of Interest

The authors declare no competing interest.

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GUIDE FOR AUTHORS

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The publication language is English. All authors must take care of the language revision on their own. The language must be clear and accurate. The work should be written in an impersonal style. The editor reserves the right to send the manuscript to be reviewed. If English is a second language for the author, please consider having the manuscript proof read and edited before submitting.

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The title of the paper 14-point, bold with capital letters, align left; titles in the text (chapters) 12-point bold, not numbered; sub-titles (subchapters) 12-point, italic, not numbered. There must be 1 empty line before and after a title or a subtitle. The text chapters must be separated by 1 empty row. The title should be concise and informative. Avoid abbreviations.

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- conclusions and/or implications;
- acknowledgements (if any);
- references (in APA style, 7th Ed);
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The manuscript should be not shorter than 6 pages (including references, tables and figures). Manuscripts should be typed on A4, in Times New Roman 12-point font size, single-spaced, 2.5 cm with all the margins, word-document (Word 6.0 or later) format.

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Tables and figures should be valuable, relevant, and visually attractive. Tables (made in Word or another software) and figures must be referred to in the text and numbered in the order of their appearance. Each table and figure should have a complete, descriptive title; and each table column an appropriate heading. The texts in tables and figures should be 11-point (in some cases 10) and their width should be 12 cm at maximum. The figures should be in format .jpg (unless done in Word or Excel); resolution 1200 dpi. Figures, tables (black and white colour, without ground-colour) and captions should be inserted within the manuscript at their appropriate locations. All the graphics (figures) must be editable. The font size should be Times New Roman for all figures and tables. Figures should be carefully explained in the text and cited in numerical order.
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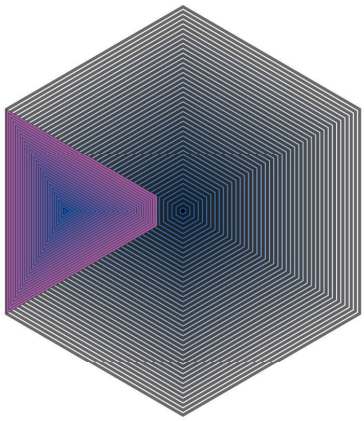
...'Education is, first of all, the formation of a person in humanity and for humanity, it is self-education (self-training) and participation in creating a more perfect world. A polarized world requires not confrontation, but synthesis. The educator in the modern context becomes a connecting link, helping children not to choose one side, but to learn to live between the poles, integrating rationality with humanity, knowledge with sensitivity. This requires a new (different) education model, namely one that not only teaches facts, but also develops the ability to see the whole, to think critically and systematically, and to act creatively and flexibly. This is not an absolute truth. This is only a reflection, realising that education is a system that will never be "finished" or "completed'...



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